			Name	•			Cost	M8	k o	FNAL Lab	or was	S Cont.	Labor	Level
1.3		Run 2b D	AQ and T	rigger Pro	ject		\$3,315,867	\$2,76	6,277	\$549,59)	0	0	0
	Notes													
	WBS Description	on:												
	Project include	TDC upgrade, XF	T upgrade,	L2 upgrade	, SVT upgrad	e, EVB upgra	de and L3 PC	eplacement	S.					
1.3.1		Rur	n 2b TDC	Project			\$583,222	\$497	744	\$85,478		0	0	0
	Notes		. 25 . 20				4000,	Ψ.σ.	,	ψου, ο			•	J
	WBS Description	on:	 -											
	This summary	element covers the	developme	ent and cons	truction of ne	w time to digi	tal converters (TDC) used i	n the reado	out of the CDI	central out	er tracker	(COT).	
			·			_		•						
1.3.1.1		L3 Start F	Run 2b TD	C Subproj	ect		\$0	\$(n	\$0		0	0	3
1.0	Notes	20 Otare i	(411 25 12	o ouspio,	001		ΨΟ	Ψ'		Ψ		Ü	· ·	J
	WBS Description	on:	 -											
	Milestone - de	noting the start of th	ne Run 2b 1	TDC level 3	subproject									
1.3.1.2														
		Specific	ation & D	evelopme	nt		\$50,840	\$44,	240	\$6,600		0	0	0
1.3.1.2	Notes	-	ation & D	evelopme	nt		\$50,840	\$44,	240	\$6,600		0	0	0
1.3.1.2		-	ation & D	evelopme	ent		\$50,840	\$44,	240	\$6,600		0	0	0
1.3.1.2	Notes WBS Description	on: ask covers the new	v TDC's spe	ecification ar	nd developme	nt on hit time	·			\$6,600		0	0	0
1.3.1.2	Notes WBS Description	on:	v TDC's spe	ecification ar	nd developme	nt on hit time	·			\$6,600		0	0	0
	Notes WBS Description This summary front-end ASDO	ask covers the new and trigger interfa	v TDC's spe	ecification ar	nd developme	nt on hit time	digitization, bu	ffer manage	ment,					
1.3.1.2	Notes WBS Description This summary front-end ASDO	ask covers the new and trigger interfa	v TDC's spe	ecification ar	nd developme	ent on hit time	·		ment,	\$6,600 \$0		0	0	0
	Notes WBS Description This summary front-end ASDO	ask covers the new and trigger interfa	v TDC's spe	ecification ar	nd developme	nt on hit time	digitization, bu	ffer manage	ment,					
	Notes WBS Description This summary front-end ASDO Notes WBS Description	ask covers the new and trigger interfa	v TDC's spe ices and da mal Speci	ecification ar ta compress	nd developme sion		digitization, bu	ffer manage	ment,					
	Notes WBS Description This summary front-end ASDO Notes WBS Description	ask covers the new and trigger interfa	v TDC's spe ices and da mal Speci	ecification ar ta compress	nd developme sion		digitization, bu	ffer manage	ment,					
	Notes WBS Description This summary front-end ASDO Notes WBS Description	ask covers the new and trigger interfa	v TDC's spe ices and da mal Speci	ecification ar ta compress	nd developme sion		digitization, bu	ffer manage	ment,					
	Notes WBS Description This summary front-end ASDO Notes WBS Description	ask covers the new and trigger interfa	v TDC's spe ices and da mal Speci	ecification ar ta compress	nd developme sion		digitization, bu	ffer manage	ment,					
	Notes WBS Description This summary front-end ASDO Notes WBS Description This task cover	Fori	v TDC's species and da	ecification are ta compressification ecifications a	nd developme sion	ics justification	\$1,120	ffer manage	ment,	\$0		0	o	
1.3.1.2.	Notes WBS Description This summary front-end ASDO 1 Notes WBS Description This task cover .1 ID Res	Fori s cost of TDC funct Block ource Name	v TDC's species and da	ecification are ta compress ification ecifications a (Chicago) Work	and their phys	ics justification	\$1,120 \$560 Finish	ffer manager \$1,1 \$5 Cost	ment,	\$0 \$0 \$Cost	Act. Cost	0 Rem.	0 Cost	0
1.3.1.2.	Notes WBS Description This summary front-end ASDO Notes WBS Description This task cover	Fori s cost of TDC funct Block ource Name	v TDC's species and da	ecification are ta compressification ecifications a	nd developme sion	ics justification	\$1,120	ffer manager \$1,1	ment, 1 20	\$0	Act. Cost \$560	0 Rem.	o	0

This item covers the TDC functional block diagram design

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"Block Diagram (Chicago)" continued

Notes

M&S BOE: N/A

Labor BOE:

100% - Chicago Electrical Eng. - 2d (16 hrs)@\$70/hr = \$1120

1.3.1.2.1.2 **Physics Justification** Units Finish Baseline Cost Act. Cost ID Resource Name Work Delay Start Cost Rem. Cost 14 7/11/02 8/7/02 \$0 \$0 \$0 PostDoc 100% 160 hrs 0 days \$0

Notes

WBS Description:

This item covers physics justification for the design from Run IIa experience and Run IIb luminosity conditions

M&S BOE: N/A

Labor BOE:

This is the time spent on the task

Block Diagram (FNAL) \$0 1.3.1.2.1.3 \$560 \$560 0 Finish Act. Cost Resource Name Units Work Delay Start Cost Baseline Cost Rem. Cost MANDSPASSL 6/24/02 \$560 \$560 \$560 \$0 560 560 0 days 6/25/02

1.3.1.2.2 Interface Specification \$17,800 \$11,200 \$6,600 0 0 0

Notes

1.3.1.2.2.1

WBS Description:

This summary task covers cost of the specification for the interfaces to COT ASDQ, XFT and other DAQ components

Trigger

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	50%	120 hrs	0 days	9/30/02	11/8/02	\$6,600	\$6,600	\$6,600	\$0
13	Physicist	100%	240 hrs	0 days	9/30/02	11/8/02	\$0	\$0	\$0	\$0

\$6,600

\$6,600

WBS Name Cost M&S **FNAL Labor** M&S Cont. Labor Level "Trigger" continued Notes WBS Description: This item covers inferace specification to Level 1 XFT M&S BOE: N/A Labor BOE: Labor estimated based upon recent experience with systems of similar scope, including CDF Run 2a TDC, trigger and calorimeter systems 1.3.1.2.2.2 \$0 **ASDQ** \$0 \$0 0 0 Cost ID Resource Name Units Work Delav Start Finish Baseline Cost Act. Cost Rem. Cost 13 Physicist 100% 120 hrs 0 days 9/30/02 10/18/02 \$0 \$0 \$0 \$0 Notes WBS Description: This item covers interface specification to the COT front-end ASDQ M&S BOE: N/A Labor BOE: Labor estimated base upon recent experience with systesm of similar scope, including CDF Run 2a TDC, trigger and calorimeter systems Crate - Hardware \$0 \$0 \$0 1.3.1.2.2.3 0 1 0 Units Cost Baseline Cost Act. Cost ID Resource Name Work Delay Start Finish Rem. Cost 13 **Physicist** 100% 120 hrs 0 days 10/21/02 11/8/02 \$0 \$0 \$0 \$0 Notes WBS Description: This item covers interface specification to VME crate M&S BOE: N/A Labor BOE:

Labor estimated based upon recent experience with systems of similar scope including CDF Run 2a TDC, trigger and calorimeter systems

WBS							Cost	M&S	FNAL Labo	r M&S Cor	ıt. Labor	Level
1.3.1.2.2.4		Data	Transmissi	on (FNAL)			\$5,600	\$5,600	\$0	1	1	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	12	MANDSPASSL	5,600	5,600	0 days	9/30/02	11/26/02	\$5,600	\$5,600	\$5,600	\$0	

Notes

WBS Description:

This item covers the interface specification for the TDC to VME data transmission

The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 8wks (160 hrs)@\$70/hr = \$11200

1.3.1.2.2.5		Data T	ransmissio	n (Chicago)	\$5,6	600	\$5,600	\$0	1	1	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	11	1 INKIND 5,600 5			13.5 days	10/17/02	11/26/02	\$5,600	\$5,600	\$5,600	\$0	

Notes

WBS Description:

This item covers the interface specification for the TDC to VME data transmission. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 8w (160 hrs)@\$70/hr = \$11200

1.3.1.2.3 Front End Timing (FNAL) \$8,960 \$8,960 \$0 0 0 0

Notes

WBS Description:

This summary task covers the hit time window digitization and programmability

WBS			Name)			Cost	M&S	FNAL Lab	or M&S Co	ont. Labor	Level
1.3.1.2.3.1	Simulation					\$3,360	\$3,360	\$0	1	1	0	
	ID	D Resource Name Units Work Delay		Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost			
	12	MANDSPASSL	3,360	3,360	0 days	8/8/02	10/31/02	\$3,360	\$3,360	\$3,360	\$0	

Notes

WBS Description:

This item covers the FPGA and board level simulation, as well as the timing interfaces to the COT front end and the CDF trigger and data acquistion system. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

20% - Chicago Electrical Eng. - 12w (96 hrs)@\$70/hr = \$6720

1.3.1.2.3.2			Test Boa	ard		\$:	5,600	\$5,600	\$0	1	1	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	12	MANDSPASSL	5,600	5,600	0 days	11/1/02	1/3/03	\$5,600	\$5,600	\$5,600	\$0	
	13	Physicist	50%	120 hrs	0 days	11/1/02	12/16/02	\$0	\$0	\$0	\$0	

Notes

WBS Description:

This item covers the cost of building a test board. This is a small board containing an FPGA and some I/O components to test and evaluate the characteristics of the Altera Stratix FPGA. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Altera chip quotation at \$1035 from Arrow Electronics. Remaining aspects of board are physicist's estimate.

Labor BOE:

Labor estimated based upon recent experience with test boards of similar scope developed for the Run 2a trigger system.

50% - Chicago Electrical Eng. - 8w (160 hrs)@\$70/hr = \$11200

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.4	Front End Timing (Chicago)	\$8,960	\$8,960	\$0	0	0	0

Notes

WBS Description:

This summary task covers the hit time window digitization and programmability

\$0 1.3.1.2.4.1 Simulation \$3,360 \$3,360 Baseline Cost Act. Cost Resource Name Units Work Delay Start Finish Cost Rem. Cost 11 INKIND 3,360 3,360 0 days 8/8/02 10/31/02 \$3,360 \$3,360 \$3,360 \$0

Notes

WBS Description:

This item covers the FPGA and board level simulation, as well as the timing interfaces to the COT front end and the CDF trigger and data acquistion system. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

20% - Chicago Electrical Eng. - 12w (96 hrs)@\$70/hr = \$6720

1.3.1.2.4.2 **Test Board** \$5,600 \$0 0 \$5,600 Resource Name Units Work Delav Start Finish Cost Baseline Cost Act. Cost Rem. Cost INKIND \$5,600 11 5.600 5,600 20 days 12/3/02 1/3/03 \$5,600 \$5,600 \$0

Notes

WBS Description:

This item covers the cost of building a test board. This is a small board containing an FPGA and some I/O components to test and evaluate the characteristics of the Altera Stratix FPGA. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Altera chip quotation at \$1035 from Arrow Electronics. Remaining aspects of board are physicist's estimate.

Labor BOE:

Labor estimated based upon recent experience with test boards of similar scope developed for the Run 2a trigger system.

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level "Test Board" continued Notes 50% - Chicago Electrical Eng. - 8w (160 hrs)@\$70/hr = \$11200 1.3.1.2.5 **Buffer Management (FNAL)** \$3,220 \$3,220 \$0 0 Notes

WBS Description:

This summary task covers the design of TDC buffer management to meet the CDF DAQ protocol

1.3.1.2.5.1 Simulation \$1,120 \$1,120 \$0 0 0 Resource Name Units Work Delav Start Finish Cost Baseline Cost Act. Cost Rem. Cost 12 MANDSPASSL \$1,120 1,120 1,120 0 days 8/8/02 9/5/02 \$1,120 \$1,120 \$0

Notes

WBS Description:

This item covers the cost of simulation for buffer management. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

20% - Chicago Electrical Eng. - 4w (32 hrs)@\$70/hr = \$2240

\$0 1.3.1.2.5.2 **Trial Implementation** \$2,100 \$2,100 0 Units Baseline Cost Act. Cost Resource Name Work Delay Start Finish Cost Rem. Cost 12 MANDSPASSL 2,100 2,100 11.25 days 9/23/02 9/26/02 \$2,100 \$2,100 \$2,100 \$0 \$0 \$0 \$0 14 PostDoc 150% 45 hrs 11.25 days 9/23/02 9/26/02 \$0

Notes

WBS Description:

This item covers the cost of a trial implementation of the buffer management design. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

WBS Name Cost M&S **FNAL Labor** M&S Cont. Labor Level "Trial Implementation" continued Notes Labor BOE: Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems. 50% - Chicago Electrical Eng. - 3w (60 hrs)@\$70/hr = \$4200 1.3.1.2.6 **Buffer Management (Chicago)** \$3,220 \$3,220 \$0 0 Notes WBS Description: This summary task covers the design of TDC buffer management to meet the CDF DAQ protocol 1.3.1.2.6.1 \$1,120 Simulation \$1,120 \$0 0 Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost INKIND \$1,120 11 1.120 1.120 8/8/02 9/5/02 \$1,120 \$1,120 \$0 0 days Notes WBS Description: This item covers the cost of simulation for buffer management. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks. M&S BOE: N/A Labor BOE: Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems. 20% - Chicago Electrical Eng. - 4w (32 hrs)@\$70/hr = \$2240 1.3.1.2.6.2 Trial Implementation \$2,100 \$2,100 0 1

11 Notes

ID

WBS Description:

INKIND

Resource Name

Units

2.100

Work

2.100

Delay

7.5 davs

This item covers the cost of a trial implementation of the buffer management design. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The

Finish

9/26/02

Cost

\$2,100

Baseline Cost

\$2,100

Act. Cost

\$2,100

Rem. Cost

\$0

Start

9/17/02

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"Trial Implementation" continued

Notes

resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 3w (60 hrs)@\$70/hr = \$4200

1.3.1.2.7 VME Interface (FNAL) \$2,940 \$2,940 \$0 0 0

Notes

WBS Description:

This summary task covers the design of the TDC chip to VME interface and other related issues

1.3.1.2.7.1 Trial Implementation \$2,100 \$2,100 \$0 1 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	2,100	2,100	0 days	11/27/02	12/17/02	\$2,100	\$2,100	\$2,100	\$0
14	PostDoc	50%	60 hrs	0 days	11/27/02	12/17/02	\$0	\$0	\$0	\$0

Notes

WBS Description:

This item covers the cost of the trial implementation of the TDC to VME interface. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 3w (60 hrs)@\$70/hr = \$4200

1.3.1.2.7.2 Simulation \$840 \$840 \$0 1 1 1 0

II)	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
	11	INKIND	840	840	0 days	9/6/02	9/26/02	\$840	\$840	\$840	\$0

WBS			Nam	Э			Cost	N	//&S FNA	L Labor N	/I&S Cont.	Labor	Level
"Simulation"	continu	ed											
	Notes												
	WBS De	scription:											
		n covers the cost of the s by FNAL are listed in the			nip to VME int	erface. The I	n-Kind resourd	es (money a	and /or labor) provid	led by Univ. of	Chicago are li	sted in this ta	sk. The resources
	M&S BC	E: N/A											
	Labor B	DE:											
	Labor es	timated based upon rec	ent experien	ce with syst	ems of similar	scope, inclu	ding the CDF I	Run 2a TDC	c, trigger and calori	meter systems.			
	20% - C	hicago Electrical Eng :	3w (24 hrs)@	\$70/hr = \$1	680								
		ŭ ŭ	,										
1.3.1.2.8		VME	E Interface	(Chicago))		\$2,940	\$2	2,940	\$ 0	0	0	0
	Notes						·						
	WBS De	scription:											
	This sur	nmary task covers the de	esign of the	ΓDC chip to	VME interface	e and other re	elated issues						
1.3.1.2.8.	1		Simulat	ion			\$840	ď	§840	\$0	1	1	0
1.5.1.2.0.	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost			O
	11	INKIND	840	840	0 days	9/6/02	9/26/02	\$840	\$840			\$0	
	Notes												
	WBS De	scription:											
	This iter	n covers the cost of the	simulation fo	r the TDC cl	nip to VME int	erface. The I	n-Kind resourc	es (money a	and /or labor) provid	led by Univ. of	Chicago are li	sted in this ta	sk. The resources
	provided	by FNAL are listed in the	ne other iden	tical tasks.				, .	, ,	·	-		
	M&S BC	PE: N/A											
	Labor B	DE:											
	Labor es	stimated based upon rec	ent experien	ce with syst	ems of similar	scope, inclu	ding the CDF I	Run 2a TDC	c, trigger and calori	meter systems.			
	20% - C	nicago Electrical Eng 3	3w (24 hrs)@	\$70/hr = \$1	680								

WBS			Name	······			Cost	M&S	FNAL Labor	M&S Cont	. Labor	Level
1.3.1.2.8.2		Tı	rial Impleme	entation		9	2,100	\$2,100	\$0	1	1	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	11	INKIND	2,100	2,100	0 days	11/27/02	12/17/02	\$2,100	\$2,100	\$2,100	\$0	

Notes

WBS Description:

This item covers the cost of the trial implementation of the TDC to VME interface. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 3w (60 hrs)@\$70/hr = \$4200

1.3.1.2.9 Design Review (FNAL) \$840 \$840 \$0 0 Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost

 ID
 Resource Name
 Units
 Work
 Delay
 Start
 Finish
 Cost
 Baseline Cost
 Act. Cost
 Rem. Cost

 12
 MANDSPASSL
 840
 840
 0 days
 7/14/03
 7/16/03
 \$840
 \$840
 \$840
 \$0

Notes

WBS Description:

The TDC design review task is a milesone.

Note: A successful review on the "Specification & Development" means we are ready to proceed to the "Detailed Design" stage.

M&S BOE: N/A

Labor BOE :

Cost of an engineer attending the review

100% Chicago Electrical Eng. - 3 days (24 hrs) @\$70/hr = \$1680

1.3.1.2.10 Design Review (Chicago) \$840 \$840 \$0 0 1

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	840	840	0 days	7/14/03	7/16/03	\$840	\$840	\$840	\$0

Notes

WBS Description:

The TDC design review task is a milesone.

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"Design Review (Chicago)" continued

Notes

Note: A successful review on the "Specification & Development" means we are ready to proceed to the "Detailed Design" stage.

M&S BOE: N/A

Labor BOE :

Cost of an engineer attending the review

100% Chicago Electrical Eng. - 3 days (24 hrs) @\$70/hr = \$1680

1.3.1.3 Detailed Design (FNAL) \$83,817 \$36,684 \$47,133 0 0 0

Notes

WBS Description:

This summary tasks covers the detailed design for the specifications developed previously.

1.3.1.3.1 Front End \$5,600 \$5,600 \$0 1 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	5,600	5,600	0 days	1/9/03	7/22/03	\$5,600	\$5,600	\$5,600	\$0

Notes

WBS Description:

This task covers the cost of the detailed desgin fo the time widow dgitization. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 4 wks (160 hrs) @\$70/hr = \$11200

1.3.1.3.2 Trigger Interface \$5,600 \$5,600 \$0 1 1 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	5,600	5,600	0 days	2/7/03	7/28/03	\$5,600	\$5,600	\$5,600	\$0

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level "Trigger Interface" continued

Notes

WBS Description:

Detailed design of the interface to the XFT Trigger. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 4 wks (160 hrs) @\$70/hr = \$11200

\$4.200 \$0 1.3.1.3.3 Compression \$4,200 0 Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost 12 MANDSPASSL 4,200 4,200 3/7/03 7/31/03 \$4,200 \$4,200 \$4,200 \$0 0 days

Notes

WBS Description:

Detailed Design of the on board data format compression design. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 3 wks (120 hrs) @\$70/hr = \$8400

1.3.1.3.4 **Buffers** \$4,200 \$4,200 \$0 1 0 Cost Baseline Cost Act. Cost Rem. Cost Resource Name Units Work Delay Start Finish 12 MANDSPASSL 4,200 \$0 4,200 0 days 3/28/03 4/17/03 \$4,200 \$4,200 \$4,200

Notes

WBS Description:

Detailed design of the L1 and L2 buffers on the TDC boards. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

WBS Name Cost M&S **FNAL Labor** M&S Cont. Labor Level

"Buffers" continued

Notes

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 3 wks (120 hrs) @\$70/hr = \$8400

1.3.1.3.5 **VME** \$2,800 \$2,800 \$0 0 ID Resource Name Units Work Delav Start Finish Cost Baseline Cost Act. Cost Rem. Cost 12 MANDSPASSL 2,800 2,800 0 days 4/18/03 1/9/04 \$2,800 \$2,800 \$2,800 \$0

Notes

WBS Description:

Detailed design for the TDC-VME interfaces. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 2 wks (80 hrs) @\$70/hr = \$5600

1.3.1.3.6 **Test Paths** \$1 \$1 \$0 0 ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost 12 MANDSPASSL 5/2/03 6/20/03 \$1 \$2.800 \$1 \$0 0 days

Notes

WBS Description:

This task covers the cost of the board testing paths. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"Test Paths" continued

Notes

100% Chicago Electrical Eng. - 2 wks (80 hrs) @\$70/hr = \$5600

1.3.1.3.7 **Board Layout** \$5,460 \$5,460 \$0 1 0 Act. Cost Rem. Cost Resource Name Units Work Delav Start Finish Cost Baseline Cost MANDSPASSL 12 5.460 5.460 0 days 5/23/03 6/20/03 \$5,460 \$8,400 \$5,460 \$0

Notes

WBS Description:

This task describes the TDC board layout design. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 6 wks (240 hrs) @\$70/hr = \$16800

1.3.1.3.8 \$0 **Board Simulation** \$1,543 \$1,543 0 Rem. Cost Resource Name Start Cost Baseline Cost Act. Cost ID Units Work Delav Finish 12 MANDSPASSL 1,543.26 1,543.26 7/7/03 8/29/03 \$1,543 \$8,400 \$1,543 \$0 0 days

Notes

WBS Description:

This task covers the simuation tests of the board layout and functions. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 6 wks (240 hrs) @\$70/hr = \$16800

WBS			Name	•			Cost	M&S	FNAL Lab	or M&S Co	ont. Labor	Level
1.3.1.3.9		Documentation					\$7,000	\$7,000	\$0	1	1	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	12	MANDSPASSL	7,000	7,000	0 days	8/18/03	9/23/03	\$7,000	\$7,000	\$7,000	\$0	

Notes

WBS Description:

This task covers the cost for the documentation of the detailed design. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 5 wks (200 hrs) @\$70/hr = \$14000

Firmware development 1.3.1.3.10 \$47.133 \$0 \$47.133 0 Baseline Cost Act. Cost Resource Name Units Work Start Finish Cost Rem. Cost Delav \$47,133 4 ElecEngF 52% 856.97 hrs 5/20/04 \$27,500 \$47,133 0 days 7/28/03 \$0

Notes

WBS Description:

This task covers the cost for firmware development for FPGA functions

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.3.11 Design Review \$280 \$280 ID Finish Resource Name Units Work Delay Start Cost Baseline Cost Act. Cost Rem. Cost 12 MANDSPASSL 280 7/16/03 \$280 280 0 days 7/16/03 \$280 \$280 \$0

Notes

WBS Description:

This milestone is a design review is for the detailed design of the TDC boards. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

Note: A successful review on the "Detailed Design" means that we are ready to proceed to the prototyping phase.

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level "Design Review" continued Notes M&S BOE: N/A Labor BOE: One day of engineer labor cost for the review meeting 100% Chicago Electrical Eng. - 1 day (8 hrs) @\$70/hr = \$560 1.3.1.4 **Detailed Design (Chicago)** \$43,551 \$43,551 \$0 Notes WBS Description: This summary tasks covers the detailed design for the specifications developed previously. 1.3.1.4.1 Front End \$5.600 \$5,600 0 ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost 11 INKIND 5.600 5.600 1/14/03 2/6/03 \$5,600 \$5,600 \$5,600 \$0 3 days

Notes

WBS Description:

This task covers the cost of the detailed desgin fo the time widow dgitization. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 4 wks (160 hrs) @\$70/hr = \$11200

1.3.1.4.2 \$5,600 \$5,600 Trigger Interface Baseline Cost ID Resource Name Units Work Delay Start Finish Cost Act. Cost Rem. Cost \$5,600 11 INKIND 5,600 5,600 2.66 days 2/11/03 2/12/03 \$5,600 \$5,600 \$0

Notes

WBS Description:

Detailed design of the interface to the XFT Trigger. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"Trigger Interface" continued

Notes

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

0 days

100% Chicago Electrical Eng. - 4 wks (160 hrs) @\$70/hr = \$11200

4,200

\$4,200 \$4,200 \$0 1.3.1.4.3 Compression 0 ΙD Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost 11 INKIND 4,200 \$4,200 \$4,200 \$4,200 \$0

3/7/03

Notes

WBS Description:

Detailed Design of the on board data format compression design. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

3/18/03

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 3 wks (120 hrs) @\$70/hr = \$8400

1.3.1.4.4 Buffers \$4,200 \$4,200 \$0 0 Baseline Cost Resource Name Units Work Delay Start Finish Cost Act. Cost Rem. Cost 11 INKIND 4,200 4/17/03 4,200 0.75 days 3/28/03 \$4,200 \$4,200 \$4,200 \$0

Notes

WBS Description:

Detailed design of the L1 and L2 buffers on the TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"Buffers" continued

Notes

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 3 wks (8400 hrs) @\$70/hr = \$8400

1.3.1.4.5 VME \$2,800 \$2,800 \$0 1 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	2,800	2,800	1.78 days	4/21/03	1/9/04	\$2,800	\$2,800	\$2,800	\$0

Notes

WBS Description:

Detailed design for the TDC-VME interfaces. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 2 wks (80 hrs) @\$70/hr = \$5600

1.3.1.4.6 Test Paths \$1 \$1 \$0 1 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	1	1	0 days	5/2/03	6/20/03	\$1	\$2,800	\$1	\$0

Notes

WBS Description:

This task covers the cost of the board testing paths. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 3 wks (80 hrs) @\$70/hr = \$5600

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
"Test Paths" continued							
Notes							

Board Layout \$5.470 \$0 1.3.1.4.7 \$5,470 0 Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost INKIND 11 5,470.32 5.470.32 0 days 5/23/03 6/20/03 \$5,470 \$8,400 \$5,470 \$0

Notes

WBS Description:

This task describes the TDC board layout design. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 6wks (240 hrs) @\$70/hr = \$16800

1.3.1.4.8 \$0 **Board Simulation** \$8,400 \$8,400 0 Resource Name Finish Cost Baseline Cost Act. Cost Rem. Cost ID Units Work Delay Start 11 INKIND 8,400 8,400 7/7/03 8/29/03 \$8,400 \$8,400 \$8,400 0 days \$0

Notes

WBS Description:

This task covers the simuation tests of the board layout and functions. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 6 wks (240 hrs) @\$70/hr = \$16800

WBS			Name)			Cost	M&S	FNAL Lab	or M&S Co	ont. Labor	Level
1.3.1.4.9		Documentation					\$7,000	\$7,000	\$0	1	1	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	11				0 days	8/18/03	9/23/03	\$7,000	\$7,000	\$7,000	\$0]

Notes

WBS Description:

This task covers the cost for the documentation of the detailed design. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 5 wks (200 hrs) @\$70/hr = \$14000

1.3.1.4.10			Design Re	eview			\$280	\$2	80 \$0	1	1	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	11	INKIND	280	280	0 days	7/16/03	7/16/03	\$280	\$280	\$280	\$0	

Notes

WBS Description:

This milestone is a design review is for the detailed design of the TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

Note: A successful review on the "Detailed Design" means that we are ready to proceed to the prototyping phase.

M&S BOE: N/A

Labor BOE:

One day of engineer labor cost for the review meeting

100% Chicago Electrical Eng. - 1 day (8 hrs) @\$70/hr = \$560

1.3.1.4.11	TDC Prototype fabrication contingency task	\$0	\$0	\$0	0	0	0
1.3.1.5	L3 TDC Design Review	\$0	\$0	\$0	0	0	3

Notes

WBS Description:

milestone on TDC Design Review . The TDC's have been sucessfully designed and prototype board fabrication can begin.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level	
1.3.1.6	Prototype - V1.0 (FNAL)	\$93,919	\$93,919	\$0	0	0	0	

Notes

WBS Description:

This summary task covers the first round of TDC prototypes including building the boards, debugging and evaulating their performance.

1.3.1.6.1			ASDQ test stan	d		\$10,854	\$10),854	\$0	0.5	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	1
	9	MANDS	10,854.43	10,854.43	0 days	4/19/04	6/25/04	\$10,854	\$35,000	\$10,854	\$0	1

Notes

WBS Description:

This task covers the cost for assemblying a teststand with VME crate and connecting it to a set of COT ASDQ boards. This will be the first true measure of timing performance using real ASDQ signals and calibration pulses. These tests will be followed by reading out the CDF full-length COT prototype chamber with prototype TDCs.

M&S BOE:

Purchase scope, dvm's etc ~ \$20K

VME crate - \$15K

Labor BOE: N/A

1.3.1.6.2		Dev	elop Test Pı	otocols		\$16,	800	\$16,800	\$0	1	1	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	

IL	O	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
	12	MANDSPASSL	16,800	16,800	0 days	10/22/03	6/28/04	\$16,800	\$16,800	\$16,800	\$0
1	13	Physicist	50%	680 hrs	0 days	10/22/03	6/28/04	\$0	\$0	\$0	\$0

Notes

WBS Description:

Task to develop the TDC test protocols, including teststand software. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 12 wks (480 hrs) @\$70/hr = \$33600

WBS			Name	!			Cost	M&S	FNAL Lab	or M&S Co	nt. Labor	Level
1.3.1.6.3			Board Fabri	cation			\$5,055	\$5,055	5 \$0	0.3	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	10	MANDSPASS	5.055	5.055	0 days	1/12/04	1/30/04	\$5.055	\$5.055	\$5.055	\$0	

Notes

WBS Description:

This item covers the cost of prototype TDC board fabrication

M&S BOE:

Spreadsheet of prototype assemb	oly			
Item	Quan	Cost	Line Total	
Prototype Run I (5 copies)				\$ 26,345
Board Fabrication				\$ 5,055
Tooling	1	575	575	
Testing	1	850	850	
Boards	6	605	3630	
Parts				\$ 19,540
FPGAs	15	1200	18000	
Connectors	50	8	400	
Panels	6	40	240	
Misc.	6	150	900	
Assembly Svcs.				\$ 1,750
	5	350	1750	

FPGA cost based upon quotations. Prototype board estimates based upon experience with Run 2a calorimeter calibration card.

Labor BOE: N/A

1.3.1.6.4 Parts Procurement \$19,540 \$0 \$19,540 0.3 0 Cost Baseline Cost Act. Cost Rem. Cost Resource Name Units Work Delay Start Finish \$19,540 \$19,540 10 **MANDSPASS** 19,540 19,540 1/12/04 1/30/04 \$19,540 \$0 0 days

Notes

WBS Description:

This item covers the cost for the parts of the prototype TDC board

M&S BOE:

Spreadsheet of prototype assemb	oly			
Item	Quan	Cost	Line Total	

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level	

"Parts Procurement" continued

Notes

Prototype Run I (5 copies)				\$ 26,345
Board Fabrication				\$ 5,055
Tooling	1	575	575	
Testing	1	850	850	
Boards	6	605	3630	
Parts				\$ 19,540
FPGAs	15	1200	18000	
Connectors	50	8	400	
Panels	6	40	240	
Misc.	6	150	900	
Assembly Svcs.				\$ 1,750
	5	350	1750	

Labor BOE: N/A

1.3.1.6.5 First Board Assembly \$350 \$350 \$0 0.3 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	350	350	0 days	2/2/04	2/27/04	\$350	\$350	\$350	\$0

Notes

WBS Description:

This item covers the cost for assembly of the first test board

M&S BOE:

Spreadsheet of prototype assemb	oly			
Item	Quan	Cost	Line Total	
Prototype Run I (5 copies)				\$ 26,345
Board Fabrication				\$ 5,055
Tooling	1	575	575	
Testing	1	850	850	
Boards	6	605	3630	
Parts				\$ 19,540
FPGAs	15	1200	18000	
Connectors	50	8	400	
Panels	6	40	240	
Misc.	6	150	900	
Assembly Svcs.				\$ 1,750

	mbly" continued										
Not	es	5 35	50 1750								
Laboı	BOE: N/A										
.3.1.6.6	First Protot	ype TDC availa	able for testing	g		\$0	\$0	\$0	0	0	2
Not											
WBS	Description:										
WBS	Description: tone - noting the first proto	type TDC board	availible for tes	sting.							
WBS Miles	·	type TDC board Bench Tests		sting.	\$2	3,648	\$23,648	\$0	1	1	0
WBS	·		S	Sting.	\$2 Start	3,648 Finish	\$23,648 Cost	\$0 Baseline Cost	1 Act. Cost	1 Rem. Cost	0
.3.1.6.7 ID 12	tone - noting the first proto Resource Name MANDSPASSL	Bench Tests Units 23,648	Work 23,648	Delay 0 days	Start 3/1/04	Finish 4/30/04	Cost \$23,648	Baseline Cost \$23,648	\$23,648	\$0	0
WBS Miles .3.1.6.7	tone - noting the first proto Resource Name MANDSPASSL	Bench Tests Units	s Work	Delay	Start	Finish	Cost	Baseline Cost			O
.3.1.6.7 ID 12 13 Not	Resource Name MANDSPASSL Physicist	Bench Tests Units 23,648	Work 23,648	Delay 0 days	Start 3/1/04	Finish 4/30/04	Cost \$23,648	Baseline Cost \$23,648	\$23,648	\$0	0
.3.1.6.7 ID 12 13 Not	Resource Name MANDSPASSL Physicist	Bench Tests Units 23,648	Work 23,648	Delay 0 days	Start 3/1/04	Finish 4/30/04	Cost \$23,648	Baseline Cost \$23,648	\$23,648	\$0	0
.3.1.6.7 ID 12 13 Not WBS	Resource Name MANDSPASSL Physicist	Bench Tests Units 23,648 100%	Work 23,648 360 hrs	Delay 0 days 0 days	Start 3/1/04 3/1/04	Finish 4/30/04 4/30/04	Cost \$23,648 \$0	Baseline Cost \$23,648 \$0	\$23,648 \$0	\$0 \$0	

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 8 wks (320 hrs) @\$70/hr = \$22400 10% Chicago Electrical Tech. - 8 wks (32 hrs) @\$39/hr = \$1248

1.3.1.6.8 Multiple Board Assy \$1,400 \$1,400 \$0 0.3 0 0 Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost 10 **MANDSPASS** 1,400 1,400 0 days 3/22/04 3/31/04 \$1,400 \$1,400 \$1,400 \$0

Notes

WBS Description:

This item covers the cost for assembly of 4 more prototype TDC boards.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Multiple Board Assy" continued

Notes

M&S BOE:

4 x \$350.00 = \$1400.00

Spreadsheet of prototype assemb	oly			
Item	Quan	Cost	Line Total	•
Prototype Run I (5 copies)				\$ 26,345
Board Fabrication				\$ 5,055
Tooling	1	575	575	
Testing	1	850	850	
Boards	6	605	3630	
Parts				\$ 19,540
FPGAs	15	1200	18000	
Connectors	50	8	400	
Panels	6	40	240	
Misc.	6	150	900	
Assembly Svcs.				\$ 1,750
	5	350	1750	

Labor BOE: N/A

1.3.1.6.9		Benc			\$5,912 \$5,912		\$0	1 1		0		
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	12	MANDSPASSL	5,912	5,912	0 days	4/1/04	5/12/04	\$5,912	\$5,912	\$5,912	\$0	
	13	Physicist	100%	240 hrs	0 days	4/1/04	5/12/04	<i>\$0</i>	\$0	\$0	\$0	
	14	PostDoc	100%	240 hrs	0 days	4/1/04	5/12/04	<i>\$0</i>	\$0	\$0	\$0	

Notes

WBS Description:

This tasks covers the bench tests for the multiple prototype TDC's. The resources (money and/or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"Bench Tests (multi boards)" continued

Notes

100% Chicago Electrical Eng. - 2 wks (80 hrs) @\$70/hr = \$5600 10% Chicago Electrical Tech. - 2 wks (8 hrs) @\$39/hr = \$312

1.3.1.6.11 Documentation \$9,800 \$9,800

						¥0,000 ¥0,000				
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	9,800	9,800	0 days	4/15/04	6/3/04	\$9,800	\$9,800	\$9,800	\$0
13	Physicist	50%	140 hrs	0 days	4/15/04	6/3/04	\$0	\$0	\$0	<i>\$0</i>

Notes

WBS Description:

This item covers the documentation of prototyping and testing of the TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

\$0

0

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% Chicago Electrical Eng. - 7 wks (140 hrs) @\$70/hr = \$9800

\$0 1.3.1.6.12 Design Review \$560 \$560 0 ID Resource Name Units Work Delav Start Finish Cost Baseline Cost Act. Cost Rem. Cost 12 MANDSPASSL 560 5/21/04 5/21/04 \$560 \$560 \$560 \$0 560 0 days

Notes

WBS Description:

This milestone refers to a design review after prototyping as a requirement for the commencement of preproduction and production. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

Note: A successful review on the "Prototype-V1.0" means that we are ready to proceed to the preproduction phase

M&S BOE: N/A

Labor BOE:

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level "Design Review" continued Notes The cost of one day labor coverage of an engineer at the review meeting 100% Chicago Electrical Eng. - 1 day (8 hrs) @\$70/hr = \$560 1.3.1.7 Prototype - V1.0 (Chicago) \$16,803 \$16,803 \$0 0 Notes WBS Description: This summary task covers the first round of TDC prototypes including building the boards, debugging and evaulating their performance. \$0 1.3.1.7.1 **Develop Test Protocols** \$16,800 \$16,800 0

Start

10/22/03

Notes

ΙD

11

WBS Description:

Resource Name

INKIND

Task to develop the TDC test protocols, including teststand software. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

Finish

1/23/04

Cost

\$16,800

Baseline Cost

\$16,800

Act. Cost

\$16,800

Rem. Cost

\$0

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

Delay

0 days

100% Chicago Electrical Eng. - 12 wks (480 hrs) @\$70/hr = \$33600

Units

16,800

Work

16,800

1.3.1.7.2 **Bench Tests** \$1 \$0 0 Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost INKIND \$0 \$0 11 0 days 3/1/04 4/30/04 \$1 \$1

Notes

WBS Description:

This task covers the bench tests for the first prototype TDC board. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

WBS Name Cost M&S FNAL Labor M&S Cont. Labor

"Bench Tests" continued

Notes

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 8 wks (320 hrs) @\$70/hr = \$22400

1.3.1.7.3

3		Benc	h Tests (m	ulti boards))		\$1			80	1 1
11	D	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
	11	INKIND	1	1	0 days	4/1/04	5/12/04	\$1	\$0	\$1	\$0

Notes

WBS Description:

This tasks covers the bench tests for the multiple prototype TDC's. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

0

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 2 wks (80 hrs) @\$70/hr = \$5600

Deaumentation

1.3.1.7.5

,	Documentation						ψι ψι ψΟ				
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
	11	INKIND	1	1	0 days	4/15/04	6/24/04	\$1	\$0	\$1	\$0

Notes

WBS Description:

This item covers the documentation of prototyping and testing of the TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% Chicago Electrical Eng. - 7 wks (140 hrs) @\$70/hr = \$9800

WBS			Name				Cost	M8	§S	FNAL Lab	or M&	S Cont.	Labor	Level
"Documenta	ation" co	ntinued												
	Notes													
1.3.1.7.6)		Design Rev	/iew			\$0	\$	0	\$0		1	1	0
	ID	Resource Name	Units		Delay	Start	Finish	Cost			ct. Cost	Rem.	Cost	-
	11	INKIND	0	0	0 days	5/21/04	5/21/04	\$0		\$0	\$0		\$0	
	Notes		•	•			•	,		•				
		scription:												
	This mile Univ. of	estone refers to a desigr Chicago are listed in this	n review after stask. The res	prototyping as sources provid	s a requirement led by FNAL a	nt for the com are listed in the	mencement of e other identi	of preprodu cal tasks.	uction and	d production. Th	ie In-Kind r	esources (r	money and /or la	bor) provided by
	Note: A	successful review on the	"Prototype-V	1.0" means th	at we are rea	dy to proceed	to the prepro	duction pha	ase					
	M&S BC	E: N/A												
	Labor Bo	DE:												
	The cost	of one day labor covera	ge of an engi	neer at the rev	view meeting									
	100% CI	nicago Electrical Eng 1	day (8 hrs)	@\$70/hr = \$56	60									
1.3.1.8		L2 Do	oian Daviou	Milestone			\$0	\$	^	\$0		0	0	3
1.3.1.0	Motoo		sign Review	vivillestone			\$ 0	Ф	U	ΦО		U	U	3
	Notes WBS De	scription:												
1.3.1.9	Milesto	ne - completion of TDC o	design review Preproduct		ing as a requi		71,806	ent of prep		and production \$31,745		0	0	0
	Notes													
	WBS De	scription:	<u></u>											
	This sun	nmary task covers prepro	oduction TDC	board fabricat	tion and perfo	rmance testin	g with single	and multipl	le boards					
		,					3 3 .							
1.3.1.9.3	3	Prod	uction test e	quipment		\$	40,000	\$40,	,000	\$0		0.5	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Co	ost	Baseline Cos	st Ac	t. Cost	Rem. Cost	7
	9	MANDS	40,000	40,000	0 days	12/6/04	12/10/0	04 \$4	0,000	\$40,0	000	\$40,000	\$0	

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"Production test equipment" continued

Notes

WBS Description:

This item coves the cost for equipment for testing/debugging TDC boards

M&S BOE:

test equipment for testing/debugging the new board logic analyzer and various other apparatus - \$40K

Labor BOE: N/A

1.3.1.9.4

Layout Modification \$4,410 \$4,410 \$0 0.5 0.5 0

0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	4,410	4,410	0 days	5/24/04	7/30/04	\$4,410	\$8,400	\$4,410	\$0

Notes

WBS Description:

This task covers the modification of the TDC board layout after prototyping. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

 $0.5 \times 70/hr \times 10.5w \times 12 hr/wk = 4410

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.9.5

Board Fabrication \$5,297 \$0 \$5,297 0.3 0 Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost 9 **MANDS** 5,297 5,297 8/10/04 8/30/04 \$5,297 \$5,297 \$5,297 \$0 0 days

Notes

WBS Description:

This task covers the cost of fabrication of the preproduction TDC boards

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Board Fabrication" continued

Notes

Note: We assume we still need the cost of "tooling/testing" after some moderate rework of design.

M&S BOE:

Note all the cost of Board Fabrication and assembly (since it is done at one vendor) for WBS 1.3.1.9.5, 1.3.1.9.7 and 1.3.1.9.9 will be in 1.3.1.9.5 - new cost \$15,925

MANDS cost increased to \$15925

New Estimate Peter Wilson Aug '04

Parts Vendor	\$ for 35 sets	Per Board	\$ for 35
Arrow (Incl FPGAs)	48,792.72		
Cool Innovations	462.50		
DDD	3,774.00		
Datel	4,610.20		
Taylor (Elma)	321.10		
Avnet	1,757.80		
Digikey	1,144.26		
Newark	3,555.59		
Parts Subtotal (35 sets)	64,418.16	1,840.52	64,418.16
Front Panel		30.00	1,050.00
(Estimate from 2003 \$19-22 each)			
Stiffener		13.00	455.00
(1999 PO for 400 @ \$6.5, 2003 PO for 50 @\$13	3)		
Parts Total (WBS 1.3.1.9.6)		1,883.52	65,923.16
Fabrication & Ass. (WBS 1.3.9.5 & .7 & .9)		455.00	15,925.00
(Altron PO + 10% for misc. additional charges (e	g Tape and reel))	
Total (w/o spare parts)		2,338.52	81,848.16

Old Estimate -

Item	Quan	Cost	Line Total	
PreProduction Run (20 copies)				
Board Fabrication				\$ 5,297
Tooling	1	575	575	
Testing	1	850	850	
Boards	22	176	3872	
Parts				\$ 50,080
FPGAs	45	1000	45000	
Connectors	160	8	1280	
Panels	20	40	800	
Misc.	20	150	3000	
Assembly Svcs.				\$ 3,000
	20	150	3000	

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
"Board Fabrication" continue	ed						
Notes							

Labor BOE: N/A

1.3.1.9.6 Parts Procurement \$0 0 0 \$50,800 \$50,800 0.3 Units Work Start Finish Cost Baseline Cost Act. Cost Rem. Cost ID Resource Name Delay \$0

						_				
9	MANDS	50,800	50,800	0 days	6/4/04	8/27/04	\$50,800	\$50,800	\$50,800	
Mataa	•				•	•		•	•	•

Notes

WBS Description:

This item covers the cost for the parts required for the preproduction TDC boards

M&S BOE:

Note all the cost of Board Fabrication and assembly (since it is done at one vendor) for WBS 1.3.1.9.5, 1.3.1.9.7 and 1.3.1.9.9 will be in 1.3.1.9.5

MANDS cost increased to \$66,925

New Estimate Peter Wilson Aug '04

Parts Vendor	\$ for 35 sets	Per Board	\$ for 35
Arrow (Incl FPGAs)	48,792.72		
Cool Innovations	462.50		
DDD	3,774.00		
Datel	4,610.20		
Taylor (Elma)	321.10		
Avnet	1,757.80		
Digikey	1,144.26		
Newark	3,555.59		
Parts Subtotal (35 sets)	64,418.16	1,840.52	64,418.16
Front Panel		30.00	1,050.00
(Estimate from 2003 \$19-22 each)			
Stiffener		13.00	455.00
(1999 PO for 400 @ \$6.5, 2003 PO for 50 @\$13	3)		
Parts Total (WBS 1.3.1.9.6)		1,883.52	65,923.16
Fabrication & Ass. (WBS 1.3.9.5 & .7 & .9)		455.00	15,925.00
(Altron PO + 10% for misc. additional charges (e	g Tape and reel))	
Total (w/o spare parts)		2,338.52	81,848.16

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"Parts Procurement" continued

Notes

Old Estimate:

Old Edilliato.				
Item	Quan	Cost	Line Total	
PreProduction Run (20 copies)				
Board Fabrication				\$ 5,297
Tooling	1	575	575	
Testing	1	850	850	
Boards	22	176	3872	
Parts				\$ 50,080
FPGAs	45	1000	45000	
Connectors	160	8	1280	
Panels	20	40	800	
Misc.	20	150	3000	
Assembly Svcs.				\$ 3,000
	20	150	3000	

Labor BOE: N/A

1.3.1.9.7 First Board Assembly \$150 \$150 \$0 0.3 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	150	150	0 days	8/31/04	9/20/04	\$150	\$150	\$150	\$0

Notes

WBS Description:

This item covers the cost for the assembly of the first preproduction TDC board

M&S BOE:

Note all the cost of Board Fabrication and assembly (since it is done at one vendor) for WBS 1.3.1.9.5, 1.3.1.9.7 and 1.3.1.9.9 will be in 1.3.1.9.5

MANDS cost reduced to \$0

New Estimate Peter Wilson Aug '04

Parts Vendor	\$ for 35 sets	Per Board	\$ for 35
Arrow (Incl FPGAs)	48,792.72		
Cool Innovations	462.50		
DDD	3,774.00		

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
"First Board Assembly" c	ontinued						

No	tes
----	-----

4,610.20		
321.10		
1,757.80		
1,144.26		
3,555.59		
64,418.16	1,840.52	64,418.16
	30.00	1,050.00
	13.00	455.00
3)		
	1,883.52	65,923.16
	455.00	15,925.00
g Tape and reel))	
	2,338.52	81,848.16
	321.10 1,757.80 1,144.26 3,555.59 64,418.16	321.10 1,757.80 1,144.26 3,555.59 64,418.16 1,840.52 30.00 13.00 1,883.52 455.00 g Tape and reel)

Old estimate:

Quan	Cost	Line Total		
			\$	5,297
1	575	575		
1	850	850		
22	176	3872		
			\$	50,080
45	1000	45000		
160	8	1280		
20	40	800		
20	150	3000		
			\$	3,000
20	150	3000		
	1 1 22 45 160 20 20	1 575 1 850 22 176 45 1000 160 8 20 40 20 150	1 575 575 1 850 850 22 176 3872 45 1000 45000 160 8 1280 20 40 800 20 150 3000	\$ 1 575 575 1 850 850 22 176 3872 \$ 45 1000 45000 160 8 1280 20 40 800 20 150 3000 \$

Parts cost dominated by FPGAs and connectors.

Labor BOE: N/A

1.3.1.9.8

Bench Tests(first board)

\$6,357 \$1,624 \$4,733

0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
3	CompProfF	20%	46.4 hrs	0 days	9/21/04	10/29/04	\$2,181	\$0	\$2,181	\$0
4	ElecEngF	20%	46.4 hrs	0 days	9/21/04	10/29/04	\$2,552	\$0	\$2,552	\$0
8	StudentU	100%	232 hrs	0 days	9/21/04	10/29/04	\$0	\$0	\$0	\$0

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Bench Tests(first board)" continued

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,624	1,624	0 days	9/20/04	10/29/04	\$1,624	\$0	\$1,624	\$0
13	Physicist	50%	116 hrs	0 days	9/21/04	10/29/04	\$0	\$0	\$0	\$0
14	PostDoc	25%	58 hrs	0 days	9/21/04	10/29/04	\$0	\$0	\$0	\$0
18	Bogdan	20%	46.4 hrs	0 days	9/21/04	10/29/04	<i>\$0</i>	\$0	\$0	\$0
19	Chappa	20%	46.4 hrs	0 days	9/21/04	10/29/04	\$0	\$0	\$0	\$0
21	Klein	20%	46.4 hrs	0 days	9/21/04	10/29/04	\$0	\$0	\$0	\$0

Notes

WBS Description:

This item covers the cost for the bench tests of the first preproduction TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

20% U of C Engineer (Averaged over entire period)

0.5 x \$70/hr x (48 hrs = 6w X 0.2 x 40hr/wk) = \$1680 Mircea Bogdan

FNAL Elec Eng (Steve Chappa) = 20% FTE FNAL Comp Prof (Rod Klein) = 20% FTE

Chicago Student = 50% FTE PostDoc (TAMU) = 25% TAMU Student = 25% Physicist = 50%

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

 1.3.1.9.9
 Multiple Board Assy
 \$25,600
 \$25,600
 \$0
 0.3
 0
 0

 ID
 Resource Name
 Units
 Work
 Delay
 Start
 Finish
 Cost
 Baseline Cost
 Act. Cost
 Rem. Cost

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	25,600	25,600	0 days	10/19/04	11/15/04	\$25,600	\$2,850	\$25,600	\$0

Notes

WBS Description:

This task covers the cost for the assembly of 19 preproduction TDC boards.

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"Multiple Board Assy" continued

Notes

M&S BOE:

Note all the cost of Board Fabrication and assembly (since it is done at one vendor) for WBS 1.3.1.9.5, 1.3.1.9.7 and 1.3.1.9.9 will be in 1.3.1.9.5

Modified to cover the costs from WBS 1.3.1.9.5, 1.3.1.9.6, 1.3.1.9.7 and 1.3.1.9.9 1.3.1.9.5-1.3.1.9.7 100% complete

New Estimate Peter Wilson Aug '04

Parts Vendor	\$ for 35 sets	Per Board	\$ for 35
Arrow (Incl FPGAs)	48,792.72		
Cool Innovations	462.50		
DDD	3,774.00		
Datel	4,610.20		
Taylor (Elma)	321.10		
Avnet	1,757.80		
Digikey	1,144.26		
Newark	3,555.59		
Parts Subtotal (35 sets)	64,418.16	1,840.52	64,418.16
Front Panel		30.00	1,050.00
(Estimate from 2003 \$19-22 each)			
Stiffener		13.00	455.00
(1999 PO for 400 @ \$6.5, 2003 PO for 50 @\$13)		
Parts Total (WBS 1.3.1.9.6)		1,883.52	65,923.16
Fabrication & Ass. (WBS 1.3.9.5 & .7 & .9)		455.00	15,925.00
(Altron PO + 10% for misc. additional charges (e	g Tape and reel))	
Total (w/o spare parts)		2,338.52	81,848.16

Old Estimate:

 $19 \times $150 = 2850 (note: M&S here only covers assembly. Parts, board fabrication and NRE covered in previous items.)

Labor BOE: N/A

Bench Tests (multi board) 1.3.1.9.10 \$19,560 \$4,200 \$15,360 0.5 0.5 0 Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost 11/16/04 11/16/04 \$0 \$0 \$0 \$0 4 **ElecEngF** 0% 0 hrs 0 days \$0 12 MANDSPASSL 0 0 0 days 11/16/04 11/16/04 \$0 \$0 \$0 960 hrs \$0 \$0 \$0 \$0 13 **Physicist** 200% 0 days 11/16/04 2/16/05

WBS		Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Bench Tests (multi board)" continued

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
18	Bogdan	10%	48 hrs	0 days	11/16/04	2/16/05	\$0	\$0	\$0	\$0
19	Chappa	10%	48 hrs	0 days	11/16/04	2/16/05	\$0	\$0	<i>\$0</i>	\$0

Notes

WBS Description:

This task describes the bench tests for the multiple preproduction TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

12-Aug-04 MandspassI reduced to \$0 from \$1120

Labor BOE:

10% of Electrical Engineer from U of Chicago 8 wks (40 hrs) @ \$70/hr

0.5 (Reimbursement) x 0.1 (FTE) x \$70/hr X 40hrs/wk X 8 wks = \$1120

10% of Electrical Engineer of Fermilab (Chappa)

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.9.10.1 Preproduction TDC board checkout \$3,120 0.5 \$0 \$3,120 0.5 0 Cost Resource Name Units Work Delay Start Finish Baseline Cost Act. Cost Rem. Cost

\$3,120 5 **ElecTechF** 50% 80 hrs 0 days 11/16/04 12/15/04 \$3,120 \$0

Notes

WBS Description:

Checkout of individual boards will be carried out at Fermilab using Rod Kleins code. Do both internal memory pulsing test and external ASDQ - Month of November

Labor BOE PPD Tech 50%

1.3.1.9.10.2 \$0 Preproduction multi board Crate tests at FNAL \$12,240 \$12,240 0.5 0.5 0 ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost 0 days 2/16/05 3 CompProfF 25% 120 hrs 11/16/04 \$5,640 \$0 \$2,914 \$2,726 ElecEngF 25% 120 hrs 0 days 11/16/04 2/16/05 \$6,600 \$0 \$3,410 \$3,190 4 \$0 0 days \$0 13 **Physicist** 200% 960 hrs 11/16/04 2/16/05 \$0 \$0 \$0 \$0 19 25% 120 hrs 0 days 11/16/04 2/16/05 \$0 \$0 Chappa 33 \$0 \$0 \$0 \$0 klei 25% 120 hrs 0 days 11/16/04 2/16/05

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"Preproduction multi board Crate tests at FNAL" continued

Notes

WBS Description:

- 1. Complete assembly and testing of 35 PreProduction boards. o Motivation: We would like to carry the project through to the point of demonstrating the operation of a full crate of boards together. In addition, there will be only a small financial benefit from canceling the assembly of the remaining 30 boards since the PCBs have been fabricated and the cost of restocking parts would be substantial fraction of their value. Some parts cannot be restocked since they were purchased on a no return basis.
- o Assembly should be completed by November 5
- o Checkout of individual boards will be carried out at Fermilab using Rod Kleins code. Do both internal memory pulsing test and external ASDQ pulsing tests. Assume completion by November 29.
- o Initial test of full crate of cards to be done on the 14th floor to make sure there are no gross problems.
- o First test of a full crate test in test stand at CDF either in Diagnostic crate in trigger room or in test stand room. Control via run control and readout using readout code by Badgett. (How mush is needed to make this happen?) Run all cards doing internal pulsing test and check validity of data and synchronicity of Bunch counters. Would like to run ~1Million events. This test to be done using regular block transfer and 32bit data width. Use readout code from Bill Badgett.
- o Test of full crate of boards using 64 bit CBLT using test code at Chicago. Goal here is to demonstrate 64 bit CBLT and measure the bandwidth capabilities of this operation.
- o No test in COT crates on the detector would take place.
- o No additional development of firmware for the XFT outputs will take place.
- o No additional development of other firmware except that needed to complete the listed tests.

Preprod TDC board - 64 bit CBLT (@ Chicago)

o Resources needed: Rod Klein (25% averaged over next 3 months), PPD Technician for checkout (50% for month of November), Steve Chappa (25% averaged over next 3 months), Assistance from DAQ group for full crate in B0. Physicists for B0 test (TA&M, Duke, Fermilab). For Chicago test need Mircea Bodan and Sasha Pamarov.

\$4,200

\$4.200

\$0

0.5

0.5

- o Schedule: complete full crate tests by end of January 2005. Need a
- clear set of goals that are achievable on this sort of time scale.
- Ultimately it is assumed that results will be included in a NIM article on the TDC design.

						* **	,	+ -,	**		
IL)	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	12	MANDSPASSL	4,200	4,200	0 days	11/16/04	2/16/05	\$4,200	\$0	\$2,170	\$2,030
1	13	Physicist	50%	240 hrs	0 days	11/16/04	2/16/05	\$0	\$0	\$0	\$0
1	18	Bogdan	25%	120 hrs	0 days	11/16/04	2/16/05	\$0	\$0	\$0	\$0

Notes

1.3.1.9.10.3

WBS Description:

1. Complete assembly and testing of 35 PreProduction boards. o Motivation: We would like to carry the project through to the point of demonstrating the operation of a full crate of boards together. In addition, there will be only a small financial benefit from canceling the assembly of the remaining 30 boards since the PCBs have been fabricated and the cost of restocking parts would be substantial

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"Preprod TDC board - 64 bit CBLT (@ Chicago)" continued

Notes

fraction of their value. Some parts cannot be restocked since they were

purchased on a no return basis.

o Assembly should be completed by November 5

o Checkout of individual boards will be carried out at Fermilab using Rod Kleins code. Do both internal memory pulsing test and external ASDQ

pulsing tests. Assume completion by November 29.

o Initial test of full crate of cards to be done on the 14th floor to

make sure there are no gross problems.

o First test of a full crate test in test stand at CDF either in Diagnostic crate in trigger room or in test stand room. Control via run control and readout using readout code by Badgett. (How mush is needed to make this happen?) Run all cards doing internal pulsing test and check validity of data and synchronicity of Bunch counters. Would like to run ~1Million events. This test to be done using regular block transfer and 32bit data width. Use readout code from Bill Badgett.

o Test of full crate of boards using 64 bit CBLT using test code at Chicago. Goal here is to demonstrate 64 bit CBLT and measure the bandwidth capabilities of this operation.

o No test in COT crates on the detector would take place.

o No additional development of firmware for the XFT outputs will take place.

o No additional development of other firmware except that needed to complete the listed tests.

o Resources needed: Rod Klein (25% averaged over next 3 months), PPD Technician for checkout (50% for month of November), Steve Chappa (25% averaged over next 3 months),

Assistance from DAQ group for full crate in B0, Physicists for B0 test (TA&M, Duke, Fermilab). For Chicago test need Mircea Bodan and Sasha Pamarov.

o Schedule: complete full crate tests by end of January 2005. Need a

clear set of goals that are achievable on this sort of time scale.

Ultimately it is assumed that results will be included in a NIM article

on the TDC design.

Labor BOE

U of C Engineer - Mircea Bogdan 25%

 $0.5 \times 70/hr \times 120 hrs (= 0.25 FTE \times 12wks \times 40hrs/wk) = 4200

1.3.1.9.12			Document	Documentation			\$0	\$0	\$0	0.5	0.5	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	12 MANDSPASSL 0 0 0 days					10/18/04	10/18/04	\$0	\$0	\$0	\$0	
	13	Physicist	10%	48 hrs	0 days	10/19/04	1/19/05	<i>\$0</i>	\$0	\$0	\$0	
	18 Bogdan 10% 48 hrs			0 days	10/19/04	1/19/05	<i>\$0</i>	\$0	\$0	\$0		

Notes

WBS Description:

This item covers the costs associated with the documentation of the preproduction boards and testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

10% of Electrical Engineer of U of Chicago 12 weeks (48h) @ \$70/hr

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"Documentation" continued

Notes

0.5 (Reimbursement) X 0.10 (FTE) X \$70/hr X 40 hrs/wk X 12 wks = \$1680

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

11-Aug-04 - MandspassI set to \$0 from \$1680

1.3.1.9.16					\$0	\$0	\$0	U	U	U
1.3.1.3.10	Build Test Pa	ttern Card		\$1 [.]	1,940	\$7,980	\$3,960	0	0	0
1.3.1.9.16.1 S _I	ecification of	Pattern Card		\$3	3,960	\$0	\$3,960	0	0	0
ID Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	

	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
Γ	4	ElecEngF	20%	72 hrs	0 days	6/8/04	8/10/04	\$3,960	\$3,960	\$3,960	\$0
	19	Chappa	20%	7.2 hrs	41.5 days	8/5/04	8/11/04	\$0	\$0	<i>\$0</i>	\$0

Notes

Labor BOE: Steve Chappa writing specification EEF @ 20%

1.3.1.9.16.2 Pattern Card schematics \$7,000 \$7,000 \$0 0 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	7,000	7,000	0 days	8/2/04	8/13/04	\$7,000	\$1,400	\$7,000	\$0
18	Bogdan	50%	196 hrs	1 day	8/3/04	10/11/04	\$0	\$0	<i>\$0</i>	<i>\$0</i>

Notes

Labor BOE: Chicago Elelctrical Engineer (Mircea Bogdan) 50% of his time at a pay rate of \$70 per hour. We pay 1/2 the cost. (0.5)

0.5 X \$70/hr X 8 weeks X 20 hrs/wk = \$7000

1.3.1.9.16.11 Firmware for Pattern Card \$980 \$980 \$0 0 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	50%	0 hrs	0 days	8/25/04	9/28/04	\$0	\$0	\$0	\$0
12	MANDŠPASSL	980	980	0 days	8/25/04	10/1/04	\$980	\$0	\$980	\$0
18	Bogdan	100%	41.37 hrs	0 days	8/25/04	10/1/04	\$0	\$0	\$0	\$0
19	Chappa	100%	78.8 hrs	0 days	8/25/04	10/1/04	\$0	\$0	\$0	\$0

Notes

WBS Description:

Develop firmware for Test Pattern Card

M&S BOE: UC Electrical Engineer (M. Bogdan) at 10% paid for with M&S Pass money = \$980

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"Firmware for Pattern Card" continued

Notes

Labor BOE: Manpower = 1/2 FTE from FNAL (S.Chappa) + 10% FTE from UC (M. Bogdan)

0.5 X \$70/hr X 28 hrs (= 0.1 FTE x 7w X 40hrs) = \$980

1.3.1.9.19 Test Software \$6,768 \$0 \$6,768 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
3	CompProfF	20%	144 hrs	0 days	6/28/04	11/2/04	\$6,768	\$9,024	\$6,768	\$0
8	StudentU	50%	360 hrs	0 days	6/28/04	11/2/04	\$0	\$0	\$0	\$0
21	Klein	20%	144 hrs	0 days	6/28/04	11/2/04	\$0	\$0	\$0	\$0

Notes

This task describes the software needed for testing the Preproduction and Production TDC's This software will control the test pattern card

Labor BOE:

FNAL Comp Prof (Rod Klien) = 20% FTE

University Student - 50% FTE

1.3.1.9.20 Preproduction Firmware \$924 \$0 \$924 0 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	10%	16.8 hrs	0 days	5/21/04	6/21/04	\$924	\$0	\$924	\$0
12	MANDSPASSL	0	0	0 days	5/21/04	5/21/04	\$0	\$0	\$0	\$0
19	Chappa	10%	91.2 hrs	0 days	5/21/04	11/2/04	\$0	\$0	\$0	\$0

Notes

Firmware development for Preproduction boards:

- 1) XFT output flag design
- 2) Implement VME 64 readout

Labor BOE:

U of Chicago EE (Mircea Bogdan/ Harold Sanders/ Mary ????)

FNAL EE (Steve Chappa) = % FTE 0.5 X \$70/hr X 29 wks X 10 hrs/wk = \$10150

11-Aug-04 - MandspassI set to \$0 from \$10,150

11-Aug-04 - ElecEngF set to 0% from 10%

WBS			Name)			Cost	M&S	FNAL Lab	or M&S Co	nt. Labor	Level
1.3.1.17	1.3.1.17 TDC Readout System				\$122,485		\$122,48	\$122,485 \$0	0	0	0	
1.3.1.17.1		Prej	oroduction	Readout			\$9,985	\$9,98	5 \$0	0	0	0
1.3.1.17.1.	.1	S	ystem arch	itecture			\$0	\$0	\$0	0	0	0
1.3.1.17.1.	2	Evalua	ition of Crat	te Processo	or		\$0	\$0	\$0	0	0	0
1.3.1.17.1.	.3	Order prep	oroduction (Crate Proce	essor		\$9,985	\$9,98	5 \$0	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	9	MANDS	9,985	9,985	0 days	4/26/04	6/14/04	\$9,985	\$9,985	\$9,985	\$0	

Notes

M&S BOE:

-Crate processor (MVME5500) = \$3500 X 3 = \$10.5K (\$9,985 in FY02 dollars)

Labor BOE: N/A

1.3.1.17.2		Pr	oduction Rea	adout		\$112,	500	3112,500	0	0		
1.3.1.17.2.	.1	Order pr	oduction Crat	e Processor		\$112,	500 \$	3112,500	\$0	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost]
	1	PhysicistF	20%	72 hrs	0 days	10/7/04	12/10/04	\$0	\$0	\$0	\$0	
	9	MANDS	112.500	112.500	0 davs	10/7/04	12/10/04	\$112.500	\$112.500	\$112.500	\$0	

Notes

M&S BOE:

-Crate processor (MVME5500) = \$3500 X 25 = \$87.5K (\$83,207 in FY02 dollars)

-Cables, withches and misc. =\$5K (\$4,755 in FY02 dollars)

-Software license (vxWorks) = \$20K (for two copies) (\$19,091 in FY02 dollars)

-Total cost = \$112.5K (\$107,052 in FY02 dollars)

Labor BOE: Manpower =1 physicist

1.3.1.17.3	L3MS: TDC Readout System Complete	\$0	\$0	\$0	0	0	3
				T -	-	-	-
1.3.1.17.4	TDC Readout System Complete	\$0	\$0	\$0	0	0	2

WBS			Name			Cos	st	M&S	FNAL Labo	r M&S Con	t. Labor	Level
"TDC Peadou	ıt Sveta	m Complete" continu	ad									
TDC Readou	ıı Oysic	in Complete Continu	-u									
1.3.2		Rur	າ 2b Level 2	2 Project		\$325,	216	\$275,320	\$49,896	0	0	0
	Notes											
V	NBS Des	scription: This summary	task covers t	he development	and production	of the Level 2	Trigger syst	em				
1.3.2.1		L3 Start	of Run 2b L	evel 2 Project		\$0		\$0	\$0	0	0	3
	Notes											
V	WBS Des	scription: Milestone dend	oting the star	t of the Level 2 T	rigger Project							
1.3.2.2		Testing and Softwa	re work exis	sting L2 Pulsar	test stand	\$0		\$0	\$0	0	0.5	0
Γ	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	13	Physicist	150%	768 hrs	16 days	9/27/02	1/2/03	\$0	\$0	\$0	\$0	
	14	PostDoc	250%	1,280 hrs	16 davs	9/27/02	1/2/03	\$0	\$0	\$0	\$0	

Notes

WBS Description: The prototype Pulsar board will be commissioned as part of a test stand for the Run 2A system. Specific tasks are: finish all mezzanine/Aux cards, Pulsar prototype testing, Rev B if needed; SLINK to PCI software work, test stand software, additional firmware work for testing ALL basic functionalities of prototypes

0

M&S BOE: N/A

Labor BOE: Based on Run 2A experience

C	ommission L2 Pulsar	for each da	ta path - proof	of principle	te:	\$0	\$0	\$0	0	0.5
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	Physicist	150%	2,040 hrs	0 days	1/3/03	9/3/03	\$0	\$0	\$0	\$0
14	PostDoc	50%	680 hrs	0 days	1/3/03	9/3/03	\$0	\$0	\$0	\$0

Notes

1.3.2.3

WBS Description: The Pulsar board will be commissioned for each data path coming in to and out of the Level 2 decision system.

M&S BOE: N/A

Labor BOE: Based on Run 2A experience.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.2.4	Preproduction run of Pulsar L2 system	\$145,516	\$145,516	\$0	0	0	0

Notes

WBS Description: This task covers the preproduction run of the Level 2 system, which consists of three Pulsar boards, associated mezzanine cards, S-link boards and interface hardware, and L2 decision processor, and will be configured for a vertical slice test.

1.3.2.4.1	Preproduction Pulsar L2 system schedule contingency task	\$0	\$0	\$0	0	0	0
1.3.2.4.2	Preproduction Readiness Review Pulsar L2 system	\$0	\$0	\$0	0	0	0

Notes

WBS Description: This milestone refers to a review of the results from commissioning the prototype Pulsar in teststand and for all data paths in preparation for preproduction

M&S BOE: N/A

Labor BOE:

1.3.2.4.3 Engineering on preproduction L2 system (FNAL) \$11,200 \$11,200 \$0 0.2 0.2 0 ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost 12 MANDSPASSL 9/19/03 11,200 11,200 0 days 11/13/03 \$11,200 \$11,200 \$11,200 \$0

Notes

WBS Description:

This item covers engineering modifications for the L2 system based on prototype Pulsar commissioning. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 2 mon = 8 weeks (320 hrs) @ \$70/hr

Based on information from Run 2a	Pulsar	test stand que	otes
Engineering	Quan	Cost	Total
2 months	2	\$10,000.00	\$20,000.00

U of C rate (as of Summer '02) \$55.25/hr

WBS		Name				C	ost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.2.4.4	4 Engineering on preproduction L2 system (Chicago)				\$1	1,200	\$11,200	\$0	0.2	0.2	0	
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	11	INKIND	11,200	11,200	0 days	9/19/03	11/13/03	\$11,200	\$11,200	\$11,200	\$0	

Notes

WBS Description:

This item covers engineering modifications for the L2 system based on prototype Pulsar commissioning.

The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 2 mon = 8 weeks (320 hrs) @ \$70/hr

Based on information from Run 2a	Pulsar	test stand quo	otes
Engineering	Quan	Cost	Total
2 months	2	\$10,000.00	\$20,000.00

U of C rate (as of Summer '02) \$55.25/hr

\$0 1.3.2.4.5 Motherboards Fabrication \$18,600 \$18,600 0.15 0 0 Baseline Cost Resource Name Units Work Delay Start Finish Cost Act. Cost Rem. Cost 18,600 9 MANDS 7/14/03 18,600 1/12/04 \$18,600 \$18,600 \$18,600 \$0 0 days

Motos

WBS Description: This item covers the cost of components and fabrication for three Pulsar motherboards for the preproduction run.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
Motherboard Fabrication	Quan	Cost	Total
Boards	3	\$6,200.00	\$18,600.00

Labor BOE: N/A

WBS	Name				Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level		
1.3.2.4.6		Mezzanine boards Fabrication				\$1	3,000	\$13,000	\$0	0.15	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	9	MANDS	13,000	13,000	0 days	7/14/03	8/25/03	\$13,000	\$13,000	\$13,000	\$0	

Notes

WBS Description: This item covers the cost of fabrication and components for 20 mezzanine cards for the preproduction run.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
Mezzanine board fabrication	Quan	Cost	Total
Boards	20	\$650.00	\$13,000.00

Labor BOE: N/A

1.3.2.4.7 S-link Auxiliary boards \$900 \$900 \$0 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	900	900	0 days	7/14/03	8/22/03	\$900	\$900	\$900	\$0

Notes

WBS Description: This item covers the fabrication and component costs for three S-Link boards for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
S-link Auxiliary board	Quan	Cost	Total
Boards	3	\$300.00	\$900.00

Labor BOE: N/A

1.3.2.4.8 LSC/LDL + fiber boards \$6,828 \$6,828 \$0 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	6,828	6,828	0 days	7/14/03	8/26/03	\$6,828	\$6,828	\$6,828	\$0

Notes

WBS Description: This item covers the cost of purchasing three Link Source Cards / Link Destination Cards and fibers for preproduction.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"LSC/LDL + fiber boards" continued

Notes

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
LSC/LDL + fiber	Quan	Cost	Total
Boards	3	\$2,276.00	\$6,828.00

Labor BOE: N/A

1.3.2.4.9 PCI-> S-link boards \$2,574 \$2,574 \$0 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	2,574	2,574	0 days	7/14/03	8/26/03	\$2,574	\$2,574	\$2,574	\$0

Notes

WBS Description: This item covers the cost of purchasing three PCI -> S-Link interface boards for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
PCI->S-link	Quan	Cost	Total
Boards	3	\$858.00	\$2,574.00

Labor BOE: N/A

1.3.2.4.10 S-link -> PCI boards \$3,213 \$3,213 \$0 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	3,213	3,213	0 days	7/14/03	8/22/03	\$3,213	\$3,213	\$3,213	\$0

Notes

WBS Description:This item covers the cost of purchasing three S-Link -> PCI boards for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
S-link -> PCI	Quan	Cost	Total
Boards	3	\$1.071.00	\$3.213.00

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"S-link -> PCI boards" continued

Notes

Labor BOE: N/A

1.3.2.4.11 L2 decision processor \$8,000 \$8,000 \$0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	8,000	8,000	0 days	7/14/03	1/27/04	\$8,000	\$8,000	\$8,000	\$0

0.15

0

Notes

WBS Description: This item covers the cost of purchasing two PC's for use as the L2 decision processor for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
L2 decision processor	Quan	Cost	Total
PC	2	\$4,000.00	\$8,000.00

Labor BOE: N/A

1.3.2.4.12 software development/memory management (FNAL) \$70,000 \$70,000 \$0 0.2 0.2 0 ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost

 ID
 Resource Name
 Units
 Work
 Delay
 Start
 Finish
 Cost
 Baseline Cost
 Act. Cost
 Rem. Cost

 12
 MANDSPASSL
 70,000
 70,000
 0 days
 9/19/03
 12/20/04
 \$70,000
 \$70,000
 \$70,000
 \$0

Notes

WBS Description:

This item covers the engineering required to design and develop the Level 2 decision system software/memory management.

The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: NA

Labor BOE: Based on Run 2A experience

50% of 1 Electrical Engineering from U of Chicago - 50 weeks (1000 hrs) @ \$70/hr

WBS			Name)			Cost	M	&S FNAL I	₋abor M&S	Cont. Lab	or Level
1.3.2.4.13		software developme	ent/memor	y manager	nent (Chicaເ	go)	\$1	9	\$1 \$0) (0.2	2 0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	11	INKIND	1	1	0 days	9/19/03	8/27/04	\$1	\$1	\$1	\$0	

Notes

WBS Description:

This item covers the engineering required to design and develop the Level 2 decision system software/memory management. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: NA

Labor BOE: Based on Run 2A experience

50% of 1 Electrical Engineering from U of Chicago - 50 weeks (1000 hrs) @ \$70/hr

100 T

)		\	ertical Slic	e Lest		\$	0	\$0	\$0	0	0.5	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	13	Physicist	150%	1,200 hrs	0 days	1/27/04	6/16/04	\$0	\$0	\$0	\$0	
	14	PostDoc	50%	400 hrs	0 days	1/27/04	6/16/04	\$0	\$0	\$0	<i>\$0</i>	

Notes

1.3.2.5

WBS Description: This item covers assembly of a vertical slice of the Level 2 system. Specific tasks include: use test stand to fine tune receiver firmware for each data path; system integration at crate level with test stand; L2 code testing for new system.

M&S BOE: N/A

Labor BOE: Based on Run 2A experience

1.3.2.6 Production run of Pulsar L2 system \$129,804 \$129,804 \$0 0 0 0

Notes

WBS Description: Summary task for Production Run of Pulsar Level 2 system: fabrication and purchase of boards, link hardware, L2 decision processors.

1.3.2.6.1 L3 Production Readiness Review for Level 2 Pulsar system \$0 \$0 \$0 0 0 3

Notes

WBS Description: This milestone refers to a review of the preproduction tests / vertical slice results in preparation for the production run.

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.2.6.3	Begin production of Level2 Pulsar system	\$0	\$0	\$0	0	0	2

Notes

WBS Description:

Milestone denoting beginning of production of Level 2 system.

1.3.2.6.4		L2 Pulsar syste	em - schedu	le contingen	cy task		\$0	\$0	\$0	0	0	0
1.3.2.6.5		Moth	nerboards Fa	abrication		\$8	0,600	\$80,600	\$0	0.15	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	9	MANDS	80,600	80,600	0 days	3/16/04	5/10/04	\$80,600	\$80,600	\$80,600	\$0	

Notes

WBS Description: This item covers the cost of components and fabrication for 13 Pulsar motherboards for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
Motherboard Fabrication	Quan	Cost	Total
Boards	13	\$6,200.00	\$80,600.00

Labor BOE: N/A

L3 Mezzanine boards Fabrication 1.3.2.6.6 \$0 \$0 0.15 0 Resource Name Act. Cost Units Work Delay Start Finish Cost Baseline Cost Rem. Cost \$0 9 MANDS \$0 0 0 0 days 9/5/03 9/5/03 \$0 \$0

Notes

WBS Description: This item covers the cost of components and fabrication of 50 mezzanine cards for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
Mezzanine board fabrication	Quan	Cost	Total
Boards	50	\$650.00	\$32,500.00

Labor BOE: N/A

WBS			Name	•			Cost	M&S	FNAL Labo	or M&S Cor	nt. Labor	Level
1.3.2.6.7		S-	ink Auxiliar	y boards			\$3,900	\$3,900	\$0	0.15	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	9	MANDS	3,900	3,900	0 days	9/22/03	10/31/03	\$3,900	\$3,900	\$3,900	\$0	

Notes

WBS Description: This item covers the cost of components and fabrication for 13 S-Link Auxilliary boards for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
S-link Auxiliary board	Quan	Cost	Total
Boards	13	\$300.00	\$3,900.00

Labor BOE: N/A

\$29,588 \$0 0 1.3.2.6.8 LSC/LDL + fiber boards \$29,588 0.15 0 Units Work Finish Cost Baseline Cost Act. Cost Rem. Cost Resource Name Delay Start

9 MANDS 29,588 29,588 10/6/03 2/2/04 \$29,588 \$29,588 0 days \$29,588 \$0

Notes

WBS Description: This item covers the cost of purchasing 13 Link Source Card/ Link Destination Cards and fibers for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
LSC/LDL + fiber	Quan	Cost	Total
Boards	13	\$2,276.00	\$29,588.00

Labor BOE: N/A

PCI-> S-link boards \$3,432 1.3.2.6.9 \$3,432 \$0 0.15

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	3,432	3,432	0 days	10/31/03	2/2/04	\$3,432	\$3,432	\$3,432	\$0

Notes

WBS Description: This item covers the cost of purchasing 4 PCI -> S-link boards for the production system.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"PCI-> S-link boards" continued

Notes

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
PCI->S-link	Quan	Cost	Total
Boards	4	\$858.00	\$3,432.00

Labor BOE: N/A

1.3.2.6.10 S-link -> PCI boards \$4,284 \$4,284 \$0 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	4,284	4,284	0 days	11/14/03	2/2/04	\$4,284	\$4,284	\$4,284	\$0

Notes

WBS Description: This item covers the cost of purchasing 4 S-link -> PCI boards for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
S-link -> PCI	Quan	Cost	Total
Boards	4	\$1,071.00	\$4,284.00

Labor BOE: N/A

1.3.2.6.11 L2 decision processor \$8,000 \$8,000 \$0 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	8,000	8,000	0 days	3/1/04	6/7/04	\$8,000	\$8,000	\$8,000	\$0

Notes

WBS Description: This item covers the cost of purchasing two PC's to be used as L2 decision processors.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
L2 decision processor	Quan	Cost	Total

WBS		Name		Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
"L2 decisior	n processor" continued								
	Notes								
	PC	2	\$4,000.00	\$8,000.00					
	Labor BOE: N/A								

1.3.2.7		System Integr	ation stand	alone w/ test	stand		\$0	\$0	\$0	0	0.5
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
	13	Physicist	150%	636 hrs	0 days	6/8/04	8/20/04	\$0	\$0	\$0	\$0
	14	PostDoc	50%	212 hrs	0 days	6/8/04	8/20/04	\$0	\$0	\$0	<i>\$0</i>

Notes

WBS Description: This item covers integration of the system, first using the Pulsar teststand to drive the Pulsar L2 system, and after studying/optimizing the performance, testing the L2 decision system using test runs with beam data.

0

M&S BOE: N/A

Labor BOE: Based on Run 2A experience.

1.3.2.9	Pulsar Level 2 subproject ready for installation	\$0	\$0	\$0	0	0	2
No	tes						
WBS	Description:						

Level 2 subproject ready for installation.

1.3.2.10	Pulsar Hardware Ready for Installation	\$0	\$0	\$0	0	0	2
1.3.2.11	Operational Readiness Review	\$0	\$0	\$0	0	0	0
1.3.2.12	L3 MS: Puslar Level 2 subproject ready for installation	\$0	\$0	\$0	0	0	3
1.3.2.13	Firmware development for deployment in B0	\$49,896	\$0	\$49,896	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	60%	907.2 hrs	0 days	1/5/05	9/30/05	\$49,896	\$49,896	\$0	\$49,896
32	Pitkanen	100%	1,544 hrs	0 days	1/5/05	9/30/05	\$0	\$0	\$0	\$0

Notes

This task is to cover the engineering used for the preparation for operation of the L2 pulsar project.

The ElecEngF fraction is determined to reflex the amount of money paid to Sakuri Pitkanen for the 9 months. (\$38,250)

WBS			Name	•			Cost	M&S	FNAL La	bor M&S Co	ont. Labor	Level	
1.3.4		Eve	ent-Builder	Upgrade		\$4	116,360	\$274,2	00 \$142,16	60 O	0	0	
	Notes			opg		•	,	4 ,-	ψ· · <u></u> , · ·		•	•	
		escription:											
	This sun	nmary element covers th	ne Event-Buil	der upgrade.	It includes the	complete softv	ware developme	ent, the con	estruction of a prototy	pe and the consti	ruction of the full s	ystem.	
1.3.4.1		L3 Sta	rt Event-Bui	lder Upgrad	le		\$0	\$0	\$0	0	0	3	
	Notes			idoi opgido			Ψο	ΨΟ	Ψ	ŭ	· ·	ŭ	
		escription:											
	This mile	estone marks the beginn	ing data for v	work on the w	narada of the E	Vont Buildor							
	11115 11111	estone marks the beginn	iing date for v	work on the u	pgrade or the c	vent-bulluer.							
1.3.4.2			chnology ev	/aluation			\$0	\$0	\$0	0.3	0	0	
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost		
	14	PostDoc	40%	384 hrs	0 days	12/5/02	5/30/03	\$0	\$0	\$0	\$0		
	Before s technoloschedule M&S BC	Notes WBS Description: Before starting to buy a prototype system an evaluation of the present technology will be performed. This evaluation results in the purchase of a prototype which is the most promising technology. The further schedule has been designed to fit the schedule for an upgrade using more powerful successor of the ATM technology. In case a different technology is chosen the schedule should still be appropriate. The price for the ATM technology is almost certainly higher than an alternative technology like Gigabit Ethernet. M&S BOE: N/A Labor BOE: Based upon experience with the Run 2a system.											
								.					
1.3.4.3	Notes WBS de		upgrade so	ntware		\$1	130,000	\$130,0	00 \$0	0	0	0	
		nmary element covers th g the drivers and the ren			or the Event-Bu	uilder upgrade.	. It includes an	evaluation o	of the operating syste	em and the assoc	iated driver, the wo	ork needed for	
1.3.4.3.1		deci	de on the O	S versions			\$0	\$0	\$0	0	0.5	0	
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost		
	14	PostDoc	50%	40 hrs	0 days	10/20/03	10/31/03	\$0	\$0	\$0	\$0		
	Notes	Notes											
	WBS de	scription:											

The decision on the version of the operating system is important since it involves a number of tests. The operation system should be as recent as possible but it has to be well established since errors can be fatal. Drivers are dependent on the version of the operating system and upgrades usually involve extra work.

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level
"decide on the OS versions" continued

Notes

M/S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.4.3.2 write Control Software \$0 \$0 \$0 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	2,920 hrs	0 days	11/4/03	4/20/05	\$0	\$0	\$0	\$0
14	PostDoc	20%	584 hrs	0 days	11/4/03	4/20/05	\$0	\$ <i>0</i>	\$0	<i>\$0</i>

Notes

WBS Description:

Write the control software that talks to the Single board computers in VME create and the converter node.

M/S BOE: N/A

Labor BOE:

Based upon experience with the D0 Run 2a system.

1.3.4.3.3 Write Monitoring Software \$0 \$0 \$0 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	2,920 hrs	0 days	11/4/03	4/20/05	\$0	\$0	\$0	\$0
14	PostDoc	20%	584 hrs	0 days	11/4/03	4/20/05	\$0	\$0	\$0	\$0

Notes

WBS Description:

Since the ATM network switches are not used in general for the application described here modifications to the drivers are almost certainly necessary. In particular the driver on the VxWorks side needs work to optimize the data throughput.

M/S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.4.3.5 L3 establish general functionality of software \$0 \$0 \$0 0 0 3

Notes

WBS Description:

This milestone marks the end of the software development. At this point we intent to freeze the development and move the code to the maintenance phase. During the commissioning further problems might be spotted but the core development is finished at this point. Establishing the general functionality is not necessarily connected to tests with real data. Two more month until the

Notes end of the 1.3.4.3.6 ID	Resource Name MANDSPASSL : : :puter professionals from ass = \$109,000 (equival) conscription: :mary element covers the is based on a quote from	tware commiss Units 130,000 m MIT for 145 da lent base cost for onstruct proto he construction of	this last test. sioning Work 130,000 ays. r two FNAL co	omputing profe It includes the	Start 12/1/04 esionals) \$143	3,560	\$54,200	\$89,360	0	0	0
Notes end of the 1.3.4.3.6 ID	e Event-Builder upgrad Sol Resource Name MANDSPASSL : : :puter professionals from the second of	te leave time for the ftware commiss Units 130,000 mm MIT for 145 date the lent base cost for construct protocom a possible version of the construction of the constru	this last test. sioning Work 130,000 ays. r two FNAL co	0 days mputing profe It includes the other 2001.	Start 12/1/04 esionals) \$143	Finish 6/29/05	Cost \$130,000	\$130,000 \$130,000 \$89,360	Act. Cost 0 \$13,000	Rem. Cost \$117,000	0
1.3.4.3.6 ID	Soin Resource Name MANDSPASSL : puter professionals from the second sec	m MIT for 145 date the construct protocome construction of the con	work 130,000 ays. r two FNAL co	0 days mputing profe It includes the other 2001.	Start 12/1/04 esionals) \$143	Finish 6/29/05	Cost \$130,000	\$130,000 \$130,000 \$89,360	Act. Cost 0 \$13,000	Rem. Cost \$117,000	0
Notes MS BOE: Two comp Mandspas 1.3.4.4 Notes WBS Des This summ The cost i Notes WBS Des This summ	Resource Name MANDSPASSL : : :puter professionals from ass = \$109,000 (equival) conscription: :mary element covers the is based on a quote from	m MIT for 145 date that base cost for construct protocome construction or come a possible veri	Work 130,000 ays. r two FNAL cootype of a prototype. Indor in Decement	0 days mputing profe It includes the other 2001.	Start 12/1/04 esionals) \$143	Finish 6/29/05	Cost \$130,000	\$130,000 \$130,000 \$89,360	Act. Cost 0 \$13,000	Rem. Cost \$117,000	0
Notes MS BOE: Two comp Mandspas 1.3.4.4 Notes WBS Des This summ The cost i 1.3.4.4.1 Notes WBS Des This summ	mANDSPASSL : : : : : : : : : : : : : : : : :	m MIT for 145 date that base cost for construct protocome construction of the construc	ays. r two FNAL co	0 days mputing profe It includes the other 2001.	12/1/04 esionals) \$143	6/29/05	\$130,000 \$54,200	\$130,000 \$89,360	0 \$13,000 0	\$117,000	
Notes MS BOE: Two comp Mandspas 1.3.4.4 Notes WBS Des This summ The cost i 1.3.4.4.1 Notes WBS Des This summ	puter professionals from the second s	m MIT for 145 da lent base cost for onstruct proto the construction of	ays. r two FNAL co otype of a prototype. ndor in Decem	omputing profe It includes the	esionals) \$143 e purchase of t	3,560	\$54,200	\$89,360	0	0	
MS BOE: Two comp Mandspas 1.3.4.4 Notes WBS Des This summ The cost i 1.3.4.4.1 Notes WBS Des This summ	puter professionals from the second s	onstruct proto	r two FNAL contype of a prototype.	It includes the	\$143		. ,			-	0
Two comp Mandspas 1.3.4.4 Notes WBS Des This summ The cost i 1.3.4.4.1 Notes WBS Des This summ	puter professionals from the second s	onstruct proto	r two FNAL contype of a prototype.	It includes the	\$143		. ,			-	0
Mandspas 1.3.4.4 Notes WBS Des This summ The cost i 1.3.4.4.1 Notes WBS Des This summ	iss = \$109,000 (equival conscription: Imary element covers the is based on a quote from	onstruct proto	r two FNAL contype of a prototype.	It includes the	\$143		. ,			-	0
Mandspas 1.3.4.4 Notes WBS Des This summ The cost i 1.3.4.4.1 Notes WBS Des This summ	iss = \$109,000 (equival conscription: Imary element covers the is based on a quote from	onstruct proto	r two FNAL contype of a prototype.	It includes the	\$143		. ,			-	0
1.3.4.4 Notes WBS Des This sum The cost i 1.3.4.4.1 Notes WBS Des This sum	scription: mary element covers the discovering the second covers t	onstruct proto	otype of a prototype.	It includes the	\$143		. ,			-	0
Notes WBS Des This sum The cost i 1.3.4.4.1 Notes WBS Des This sumr	scription: mary element covers the state of	ne construction com a possible ver	of a prototype.	nber 2001.	e purchase of		. ,			-	0
This sumi The cost i 1.3.4.4.1 Notes WBS Des This sumi	mary element covers the	om a possible vei	ndor in Decem	nber 2001.		the necessary	elements, the ins	stallation and evalua	tion of a test stand	i.	
This sumi The cost i 1.3.4.4.1 Notes WBS Des This sumi	mary element covers the	om a possible vei	ndor in Decem	nber 2001.		the necessary	elements, the ins	stallation and evalua	tion of a test stand	d.	
The cost in the co	is based on a quote fro	om a possible vei	ndor in Decem	nber 2001.		the necessary	elements, the ins	stallation and evalua	tion of a test stand	i.	
WBS Des This sumr		, p. c.c., pc c	ystem (1/4)		\$54	,200	\$54,200	\$0	0	0	0
This sumr	scription:										
	·										
.3.4.4.1.1	mary task covers the p	urchase of the p	rototype syste	m. It includes	the submissio	on of the PO an	id the implement	ation plan, the purch	ase formalities an	d the arrival of th	e hardwa
	L3 Submit	PO and impler	mentation pla	an	\$	80	\$0	\$0	0	0	3
Notes											
WBS Des	scription:										
The subm	nission of the purchase	order and the in	nplementation	plan is a mile	stone.						
.3.4.4.1.2	nurch:	ase formalities	for switch		\$40	,000	\$40,000	\$0	0.3	0	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost		Rem. Cost	Ü
	MANDS	40,000	40,000	0 days	10/2/03	10/24/03	\$40,000	\$40,000	\$40,000	\$0	
Notes	-	-,	-,				r - 1	p. 12,220	, ,,	7.5	
WBS Des	scription:										
	·										
Purchase For Cisco						WIDE					

FNAL PO 553957 - cost \$36,181.14

WBS Name Cost M&S **FNAL Labor** M&S Cont. Labor Level "purchase formalities for switch" continued Notes Labor BOE: N/A Purchase formalities for single board computers \$5,200 \$0 0 0 0 1.3.4.4.1.3 \$5,200 Resource Name Units Work Delav Start Finish Cost Baseline Cost Act. Cost Rem. Cost MANDS 9 5.200 5,200 10/2/03 10/24/03 \$5,200 \$5,200 \$5,200 \$0 0 days Notes WBS Description: Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS. For 2 VMIC single board computes for VME crates. VMIVME-7805-110 M/S BOE: Quote to FNAL 21-Aug-03 Quote # C03-5819 price \$2600 per SBC - 2 required - \$5200 Labor BOE: N/A 1.3.4.4.1.4 Arrival of the prototype Event Builder hardware \$0 0 2 Notes WBS Description: The arrival of the hardware is a milestone which marks the beginning of the test system installation. \$0 \$0 1.3.4.4.1.5 EVB Construct prototype schedule contingency \$0 0 \$0 1.3.4.4.1.6 Purchase formalities for Cisco 3750 switch \$9,000 \$9,000 0 Baseline Cost Act. Cost ID Resource Name Units Work Delay Start Finish Cost Rem. Cost

9 Notes

WBS Description:

MANDS

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.

9,000

0 days

1/16/04

For 1 Cisco Catalyst 3750 Switch and SFP GBIC daughter/transciever cards

9,000

M/S BOE:

from e-mail message from Bruce Knuteson 27-Nov-03:

Cisco Catalyst 3750 switch for test system

Cisco part number should be: WS-C3750G-24TS-S

3/12/04

\$9,000

\$9,000

\$9,000

\$0

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"Purchase formalities for Cisco 3750 switch" continued

Notes

The switch is a 24-port 10/100/1000 copper ports, and 4 SFP Gigabit ports. List Price is \$7000

You will need to order the SFP GBIC daughter/transceiver cards Cisco part number: GLC-SX-MM, GE SFP, LC connector SX transceiver List Price is \$500Each

Labor BOE: N/A

1.3.4.4.2

<u>′</u>		install test s	stand		\$0		\$0	\$0	U	0.5
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	512 hrs	0 days	10/27/03	2/2/04	\$0	\$0	\$0	\$0
14	PostDoc	20%	102.4 hrs	0 days	10/27/03	2/2/04	\$0	\$0	<i>\$0</i>	\$0

Notes

WBS Description:

The installation of the goes quick since the environment is prepared.

evaluate test stand

M/S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.4.4.3

								· · · · · · · · · · · · · · · · · · ·		
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	512 hrs	0 days	2/3/04	4/30/04	\$0	\$0	\$0	\$0
1.	4 PostDoc	20%	102.4 hrs	0 days	2/3/04	4/30/04	\$0	\$0	\$0	\$0

\$0

\$0

0.5

0

Notes

WBS Description:

The evaluation of the test stand is meant to establish the technical functionality of the hardware. Potential problems might require change of equipment.

M/S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.4.4.4	L3 establish functionality of hardware	\$0	\$0	\$0	0	0	3

0

0

0

Notes

WBS Description:

Establishing the hardware functionality of the test system is a milestone and marks the point when the complete system should be purchased.

1.3.4.4.6 Engineering for Prototype system \$42,240 \$0 \$42,240 0 Start Finish Cost Baseline Cost Act. Cost Resource Name Units Work Delay Rem. Cost \$42,240 \$38,927 \$34,214 \$8,026 4 **ElecEngF** 24% 768 hrs 0 days 10/2/03 5/6/05

Notes

WBS Description:

The engineering effort by Ron Rechenmacher of FNAL on Prototype Event Builder system

M&S BOE: N/A

Labor BOE:

Estimation based on similar work done with D0 collaboration on their existing system

1.3.4.4.7 Network Stetup for Prototype system \$7,520 \$0

• •		T TO THO THE	ototap ioi i		0111		φ.,ο_ο	ΨΟ	Ψ1,020	Ū	· ·
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
	3	CompProfF	100%	160 hrs	0 days	2/3/04	3/1/04	\$7,520	\$7,520	\$7,520	\$0

\$7,520

Notes

WBS Description:

The effort by FNAL Computing Division Network group on setting up the network switch for the Prototype Event Builder system

M&S BOE: N/A

Labor BOE:

Estimation based on similar work done through out the lab

Zoumation Bacoa on omittal work across through out the lab

1.3.4.4.8		Engin	eering for T	ΓDC readout			\$39,600	\$0	\$39,600	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
	4	FlecFnaF	50%	720 hrs	0 days	9/1/04	5/20/05	\$39,600	\$39,600	\$0	\$39,600

1.3.4.5 construct full size system \$132,800 \$80,000 \$52,800 0 0 0

Notes

WBS Description:

This summary element covers the construction of the full size Event-Builder system. It includes a readiness review, the purchase, installation and evaluation of the hardware and finally the completion of the system.

WBS		Name			(Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
"construct full siz	e system" continued										
Note M&S B	S										
The co	st is based on a quote by	a possible ver	ndor from Dec	ember 2001.							
		•				Φ0	40	Φ.			
1.3.4.5.1 Note	Production Re	eadiness Rev	iew - Event	Builder		\$0	\$0	\$0	0	0	0
	escription:										
Produ	ction readiness review fo	or the Event Bu	ilder. Success	sful outcome f	rom the review	v means that we	e will proceed t	o the production phas	e of the project.		
	OE: N/A						•		, ,		
I abor I	BOE: N/A										
				=\(\alpha\)							
Schedu	ıle BOE: lag of 100 days	due to anticip	ated funding f	or FY2004							
1.3.4.5.3	Event Builde	r Production	Readiness F	Review		\$0	\$0	\$0	0	0	2
Note											
WBS D	escription:										
After th	e system has been prove	en to work as a	prototype a r	eadiness revie	ew formally ap	proves the purc	chase of the ful	I size system.			
1.3.4.5.4	purcha	ase remainin	g hardware)	\$8	80,000	\$80,000	\$0	0	0	0
Note			•			,	. ,				
WBS D	escription:										
This su formali	mmery task covers the p	urchase of the al of the hardw	remaining ha	rdware to con	struct the full s	size system. It ii	ncludes the sul	bmission of the purcha	ase order and im	olementation plan	, purchase
1.3.4.5.4.1	I 3 cubmit	PO and impl	amentation i	olan		\$0	\$0	\$0	0	0	3
Note		i O and impr	ememation _l	Jian		ΨΟ	ΨΟ	ΨΟ	U	O	3
	escription:										
	omission of the purchase	order and the	implementati	on plan is a m	ilaatana						
The su	omission of the purchase	didei and the	шретепан	on pian is a m	ilestorie.						
1.3.4.5.4.2	ŗ	ourchase form	nalities		\$8	30,000	\$80,000	\$0	0.3	0	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	7
9	MANDS	80,000	80,000	0 days	6/23/04	8/30/04	\$80,000	\$80,000	\$80,000	\$0	
Note	s										

WBS Description:

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS. These include the purchase of 24 single board computers and

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
"purchase formalities" contir	nued						
Notos							

2 48 port Cisco WS-X6748-GE-TX Gigabit Ethernet over copper modules.

M/S BOE:

Vendor quote August 21,2003 24 Single board computers - \$2457.90/each = \$58,989.60 Cisco WS-X6748-GE-TX module price comes from PO 553957 - \$10,000/each = \$20,000

Labor BOE: N/A

1.3.4.5.4.4 Arrival of the Event Builder hardware \$0 \$0 \$0 0 0 2

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the production system installation.

1.3.4.5.4.6	· · · · · · · · · · · · · · · · · · ·	Contingency on	arrival of ev	vent builder h	nardware	\$	60	\$0	\$0	0	0	0
1.3.4.5.5		assemble ne	ew hardwar	e in B0 third	floor	\$8,	800	\$0	\$8,800	0	0.5	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	4	FlecEngE	100%	160 hrs	0 days	11/29/04	12/28/04	\$8,800	\$8.800	\$8,800	\$0	

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	100%	160 hrs	0 days	11/29/04	12/28/04	\$8,800	\$8,800	\$8,800	\$0
8	StudentU	100%	160 hrs	0 days	11/29/04	12/28/04	<i>\$0</i>	\$0	<i>\$0</i>	\$0
14	PostDoc	20%	32 hrs	0 days	11/29/04	12/28/04	\$0	\$0	\$0	\$0

Notes

WBS Description:

The assembly of the new hardware should go smoothly since the room is well prepared.

M/S BOE: N/A

Labor BOE:

1.3.4.5.6

Based upon experience with the Run 2a system.

3	eva	luate the Fu	ıll System		\$17	',600	\$0	\$17,600	0	0.5
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	100%	320 hrs	0 days	12/29/04	2/25/05	\$17,600	\$17,600	\$880	\$16,720
8	StudentU	100%	320 hrs	0 days	12/29/04	2/25/05	\$0	\$0	\$0	\$0
14	PostDoc	20%	64 hrs	0 days	12/29/04	2/25/05	<i>\$0</i>	\$0	\$0	\$0

Notes

WBS Description:

The evaluation of the new hardware might reveal problems in some of the components and we leave some time in case hardware needs to be exchanged by the vendor. The new software is being tested as well.

0

	e Full S <u>Notes</u> M/S BO		Namo	9			Cost	M&S	FNAL Labo	r M&S Con	t. Labor	Level
	Labor B Based u	SOE: upon experience with the	Run 2a syst	em.								
1.3.4.5.7	Notes WBS D			ality of hardw		and marks th	\$0	\$0	\$0	0 sed.	0	3
1.3.4.5.9		-	-	r full sized sy			\$26,400	\$0	\$26,400	0	0	0
1.3.4.5.9	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	U
	4	ElecEngF	50%	480 hrs	0 days	9/1/04	2/25/05	\$26,400	\$26,400	\$5,280	\$21,120	
1.3.4.6	Notes		a taking to i	new Event B	uilder		\$0	\$0	\$0	0.3	0.5	0
	Hardwa	re and software commis		ves data taking	since only the	en the last p	roblems can be	found and cor	rected. Experience from	m Run IIa show t	that 2 month is a rea	asonable time to
	M/S BO		•									
	Labor B		e Run 2a syst	em.								
1.3.4.7 1.3.4.8	Notes WBS D	Finish		iilder Upgrad der Upgrade			\$0 \$0	\$0 \$0	\$0 \$0	0	0	3
		lestone marks the end of iionality has been prover			. This means t	that the hard	ware is in place	and has been	proven to technically	work, the softwar	re development has	been finished and

1.3.4.10		Procure sup	oport hardwa	re and softw	/are	\$1	0,000	\$10,000	\$0	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	9	MANDS	10,000	10,000	0 days	10/2/03	3/11/05	\$10,000	\$10,000	\$8,694	\$1,306	

WBS			Name			C	ost	M&S	FNAL Labor	M&S Cont.	Labor	Level
"Procure su	pport ha	ardware and software"	continued									
	Note											
	These f	unds are to cover miscel	laneous expens	ses.								
1.3.5		Computer	for Level3 P	C Farm / D	AQ	\$38	2,500	\$382,500	\$0	0	0	0
	Note											
	WBS D	escription:										
		mmary task covers the co are based on a recent pu			eneral DAQ sy	stem and the L	evel-3 PC Far	m. The purchas	es are staged since t	hey are replacing	PCs which beco	me obsolete.
1.3.5.1		Start Compu	iters for Leve	3 PC Farm/	DAO	q	\$ 0	\$0	\$0	0	0	3
	Note	•				`	, ,	40	Ψ3	· ·	· ·	· ·
	WBS D	escription:										
	This mi	lestone marks the beginn	ing of the DAQ	and Level3 o	computer purc	hases.						
1.3.5.3		replac	ce 15 DAQ P	Cs (2004)		\$37	',500	\$37,500	\$0	0	0	0
	Note											
	WBS D	escription:										
	Summa	ry task describing the pu	rchase of 15 D	AQ compute	rs in FY004.							
1.3.5.3.1	l	submit P	O and implem	nentation pla	เท	(\$ 0	\$0	\$0	0	0	3
	Note											
	WBS D	escription:										
	The sul	omission of the purchase	order and the i	mplementatio	n plan is a mi	lestone.						
1.3.5.3.2	2	•	urchase form				' ,500	\$37,500	\$0	0.3	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	9	MANDS	37,500	37,500	0 days	10/14/04	4/13/05	\$37,500	\$37,500	\$22,500	\$15,000	_
	Note											
		escription:										
	Purcha	se formalities take a rathe	er long time at l	Fermilab, ther	efore they are	included in the	e WBS.					
	M&S B	OE:										
	M&S co	ost increased due to \$15,	000 transfer fro	m WBS 1.3.5	.2.2							
	Recent	PO for similar purchase	in run 2a.									

Labor BOE: N/A

WBS			Name	•			Cost	IV	l&S FNAL	Labor M8	SS Cont.	Labor	Level
"purchase fo	rmalitie	s" continued											
•	Notes												
	Schedul	e BOE: lag of 230 days	due to anticip	oated funding	for FY2004								
1.3.5.3.3		install and	test one pr	ototype mad	chine		\$0	,	\$O \$	60	0	0.5	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cos				n. Cost	
	8 14	StudentU PostDoc	100% 20%	80 hrs 16 hrs	0 days 0 days	12/13/0 12/13/0			\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	
			2070	101110	o dayo	12/10/0	1 12/20/	07	Ψ0	ΨΟ	ΨΟ	ΨΟ	
	Notes WBS De	escription:											
	cloning. M&S BC Labor B		Run 2a syste	em.		ad the approp	\$0	-		remilab. The	o	O	a vendor for
	Notes												
	WBS De	scription:											
	The arriv	val of the hardware is a	milestone whi	ch marks the	beginning of	the test syste	em installation						
1.3.5.3.5			burn in ph	nase			\$0		\$0 \$	60	0	0.5	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Co		-
	8	StudentU	50%	40 hrs	0 days	1/7/05	1/21/05	\$0	\$0	\$0		\$0	
	Notes												
	WBS De	scription:											
	In the bu	ırn in phase the PCs are	running und	er load to find	d potential pro	blems. The v	endor is respo	nsible to re	place failing hardwa	re in due time.			

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

WBS			Name				Cost	M&S	FNAL Lal	bor M&S C	ont. Labor	Level
1.3.5.3.6)	installa	tion into the	DAQ syster	n		\$0	\$0	\$0	0	0.5	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	8	StudentU	100%	40 hrs	0 days	1/24/05	1/28/05	\$0	\$0	\$0	\$0	
	14	PostDoc	20%	8 hrs	0 days	1/24/05	1/28/05	\$0	\$0	\$0	\$0	
		S escription: tallation of the nodes into	their final les	ation about	ha rathar ama	oth sings the	onvironment w	ill be well pr	onarad			
	M&S B0	DE: N/A	ineli ililarioc	ation snould	be father Sillo	our since the	environment w	nii be weli pi	ерагеи.			
		upon experience with the	Run 2a syste	em.								
1.3.5.3.7	Notes WBS D		of 15 PCs fro			he test system	\$0	\$0	\$0	0	0	2
1.3.5.3.8		Replace 15 D			-	no tool cyclo.	\$0	\$0	\$0	0	0	0
1.3.5.4	Notes	•	ce 20 DAQ	PCs (2005)			\$30,000	\$30,0	00 \$0	0	0	0
	Summa	ry task describing the pu	rchase of 20	DAQ compute	ers in FY2005.							
1.3.5.4.1	Notes		O and imple	mentation p	lan		\$0	\$0	\$0	0	0	3
	The sub	omission of the purchase	order and the	e implementat	tion plan is a n	nilestone.						
1.3.5.4.2		•	urchase forr				\$30,000	\$30,0		0.3		0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	9	MANDS	30,000	30,000	0 days	5/6/05	8/1/05	\$30,000	\$30,000	\$6	\$30,000]
	Notes	3										
	WBS D	escription:										

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"purchase formalities" continued

Notes

M&S BOE:

Based on recent PO from similar run 2a purchase

Labor BOE: N/A

1.3.5.4.3

3		install and	test one pro	ototype mad	hine		\$0	\$	0 \$0	(0.5
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
Ī	8	StudentU	100%	80 hrs	0 days	8/2/05	8/15/05	\$0	\$0	\$0	\$0
	14	PostDoc	20%	16 hrs	0 days	8/2/05	8/15/05	\$0	\$0	\$0	\$0

Notes

WBS Description:

To insure that the machines perform to the specifications and to download the appropriate software they are installed and tested at Fermilab. The prototype is sent back to the vendor for cloning.

0

0

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.5.4.4 arrival of 20 DAQ PCs from the vendor \$0 \$0 \$0 0 0 3

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the test system installation.

 1.3.5.4.5
 burn in phase
 \$0
 \$0
 \$0
 0
 0.5

 ID
 Resource Name
 Units
 Work
 Delay
 Start
 Finish
 Cost
 Baseline Cost
 Act. Cost
 Rem. Cost

								<u> </u>		
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	50%	40 hrs	0 days	8/16/05	8/29/05	\$0	\$0	\$0	\$0

Notes

WBS Description:

In the burn in phase the PCs are running under load to find potential problems. The vendor is responsible to replace failing hardware in due time.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

WBS			Name			(ost	М&	S FNAL I	_abor M&	S Cont.	Labor	Lev
in pha	se" cont	inued											
•	Notes												
3.5.4.6	i	installa	tion into the [DAQ system			\$0	\$0	\$0		0	0.5	0
	ID	Resource Name	Units						Baseline Cost	Act. Cost	Rem. Co		
	8	StudentU	100%	40 hrs		8/30/05	9/6/05	\$0	\$0	\$(\$0	
	14	PostDoc	20%	8 hrs	0 days	8/30/05	9/6/05	\$0	\$0	\$0)	<i>\$0</i>	
	Notes												
	WBS De	scription:											
	The inst	allation of the nodes into	their final loca	tion should be	rather smooth	since the er	vironment wil	l be well pr	repared.				
	M&S BC	E: N/A											
	Labor B	DE:											
	Based u	pon experience with the	Run 2a syster	n.									
.5.4.8	}	Replace 20 D	AQ PCs sch	edule conting	gency		\$0	\$0	\$0		0	0	0
3.5.5		replac	e 70 Level 3	PCs (2004)		\$10	5,000	\$105,0	000 \$0		0	0	0
	Notes	-											
	WBS De	scription:											
	Summa	y task describing the pu	rchase of 70 le	wel 3 compute	re in FV2004								
		-		•									
3.5.5.1		submit P	O and impler	nentation pla	n		\$0	\$0	\$0)	0	0	3
,.J.J. I	Notes												
	WBS De	scription:											
			order and the	implementatio	n plan is a mile	stone.							
		mission of the purchase		,									
		mission of the purchase				\$1 (05,000	\$105,0	000 \$0)	0.3	0	0
	The sub		urchase form	alitiae			,5,000	Ψ105,0					_
	The sub	p	urchase form		Dolov		Einich	C	ant Donalir	o Coot	Ant Cont	Dom Coot	
	The sub	p Resource Name	Units	Work	Delay	Start	Finish	C(Act. Cost	Rem. Cost	
	The sub	Resource Name MANDS								ne Cost 2 \$105,000	Act. Cost \$105,000	Rem. Cost \$0)
3.5.5.2	The sub	Resource Name MANDS	Units	Work		Start)

M&S BOE:

WBS Name Cost M&S **FNAL Labor** M&S Cont. Labor Level

"purchase formalities" continued

Notes

Recent PO for similar purchase in run 2a.

Labor BOE: N/A

Schedule BOE: lag of 230 days due to anticipated funding for FY2004

1.3.5.5.3		install and	test one pro	ototype mac	hine		\$0	\$0	\$0	0	0.5
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
	8	StudentU	100%	80 hrs	0 days	9/23/04	10/6/04	\$0	\$0	\$0	\$0
	14	PostDoc	20%	16 hrs	0 days	9/23/04	10/6/04	\$0	\$0	\$0	\$0

Notes

WBS Description:

To insure that the machines perform to the specifications and to download the appropriate software they are installed and tested at Fermilab. The prototype is sent back to the vendor for cloning.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.5.5.5 Arrival of 70 Level3 and 15 DAQ PCs from the vendor \$0 \$0 2

0

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the installation of 70 Level 3 worker node PC's and 15 DAQ PC's.

6			burn in p	hase			\$0	\$0	\$0	0	0.5
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
	8	StudentU	50%	100 hrs	0 days	11/4/04	12/10/04	\$0	\$0	\$0	\$0

Notes

1.3.5.5.6

WBS Description:

In the burn in phase the PCs are running under load to find potential problems. The vendor is responsible to replace failing hardware in due time.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Research Research StudentU 100% 40 hrs 0 days 12/13/04 12/17/04 \$0 \$0 \$0 \$0 \$0 \$0 \$0	WBS			Name			C	ost	M&S	FNAL Labor	M&S Cont.	Labor	Level
8	1.3.5.5.7		installat	tion into the D	AQ system		;	\$0	\$0	\$0	0	0.5	0
14		ID	Resource Name		Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost I	Rem. Cost	
WBS Description: The installation of the nodes into their final location should be rather smooth since the environment will be well prepared. M&S BOE: N/A Labor BOE: Based upon experience with the Run 2a system. 1.3.5.6 replace 140 Level 3 PCs (2005) \$210,000 \$210,000 \$0 0 Notes WBS Description: Summary task describing the purchase of 140 level 3 computers in FY2005. 1.3.5.6.1 submit PO and implementation plan \$0 \$0 \$0 \$0 0 Notes WBS Description: The submission of the purchase order and the implementation plan is a milestone. 1.3.5.6.2 purchase formalities \$210,000 \$210,000 \$0 0.3 ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost 9 MANDS 210,000 210,000 \$0 0 40 \$0 000 \$0 0000 \$0 00000 \$0 00000000									\$0 \$0	\$0 \$0		\$0 \$0	
The installation of the nodes into their final location should be rather smooth since the environment will be well prepared. M&S BOE: N/A Labor BOE: Based upon experience with the Run 2a system. 1.3.5.6 replace 140 Level 3 PCs (2005) \$210,000 \$210,000 \$0 0 Notes WBS Description: Summary task describing the purchase of 140 level 3 computers in FY2005. 1.3.5.6.1 submit PO and implementation plan \$0 \$0 \$0 \$0 0 Notes WBS Description: The submission of the purchase order and the implementation plan is a milestone. 1.3.5.6.2 purchase formalities \$210,000 \$210,000 \$0 0.3 \[\begin{array}{ c c c c c c c c c c c c c c c c c c c													
M&S BOE: N/A Labor BOE: Based upon experience with the Run 2a system. 1.3.5.6 replace 140 Level 3 PCs (2005) \$210,000 \$210,000 \$0 0 Notes WBS Description: Summary task describing the purchase of 140 level 3 computers in FY2005. 1.3.5.6.1 submit PO and implementation plan \$0 \$0 \$0 0 Notes WBS Description: The submission of the purchase order and the implementation plan is a milestone. 1.3.5.6.2 purchase formalities \$210,000 \$210,000 \$0 0.3 D Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost 9 MANDS 210,000 210,000 0 days 5/6/05 8/1/05 \$210,000 \$210,000 \$0 Notes		WBS D	escription:										
Notes WBS Description: Summary task describing the purchase of 140 level 3 computers in FY2005. 1.3.5.6.1 submit PO and implementation plan \$0 \$0 \$0 \$0 0 Notes WBS Description: The submission of the purchase order and the implementation plan is a milestone. 1.3.5.6.2 purchase formalities \$210,000 \$210,000 \$0 0.3 ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost 9 MANDS 210,000 210,000 0 days 5/6/05 8/1/05 \$210,000 \$210,000 \$0		M&S B0	DE: N/A OE:			Taurier Smooth	Since the en	viioiment wiii	ве жен ргера	icu.			
Summary task describing the purchase of 140 level 3 computers in FY2005. 1.3.5.6.1 submit PO and implementation plan \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	1.3.5.6		replace	140 Level 3	PCs (2005)		\$21	0,000	\$210,000	\$0	0	0	0
Summary task describing the purchase of 140 level 3 computers in FY2005. 1.3.5.6.1 submit PO and implementation plan \$0 \$0 \$0 0 Notes WBS Description: The submission of the purchase order and the implementation plan is a milestone. 1.3.5.6.2 purchase formalities \$210,000 \$210,000 \$0 0.3 ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost 9 MANDS 210,000 210,000 0 days 5/6/05 8/1/05 \$210,000 \$210,000 \$0 Notes	:												
WBS Description: The submission of the purchase order and the implementation plan is a milestone. 1.3.5.6.2 purchase formalities \$210,000 \$210,000 \$9 Description: 1.3.5.6.2 purchase formalities \$210,000 \$210,000 \$9 Description: 1.3.5.6.2 purchase formalities \$\$210,000 \$\$\$210,000 \$\$\$\$\$\$9 \$\$\$\$0.3 ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost 9 MANDS 210,000 210,000 0 days 5/6/05 8/1/05 \$210,000 \$210,000 \$0 Notes			submit Po					\$0	\$0	\$0	0	0	3
1.3.5.6.2 purchase formalities \$210,000 \$210,000 \$0 0.3 ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost 9 MANDS 210,000 210,000 0 days 5/6/05 8/1/05 \$210,000 \$210,000 \$0 Notes Note	;												
ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost 9 MANDS 210,000 210,000 0 days 5/6/05 8/1/05 \$210,000 \$210,000 \$0 Notes			•	order and the i	mplementatior	n plan is a mile	stone.						
9 MANDS 210,000 210,000 0 days 5/6/05 8/1/05 \$210,000 \$210,000 \$0 Notes	1.3.5.6.2		p	urchase forma	alities		\$21	0,000	\$210,000	\$0	0.3	0	0
Notes												Rem. Cost	
		9	MANDS	210,000	210,000	0 days	5/6/05	8/1/05	\$210,000	9 \$210,00	0 \$0	\$210,000	
WBS Description:													
		WBS D	escription:										
Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.		Purchas	se formalities take a rathe	er long time at F	ermilab, there	fore they are in	ncluded in the	e WBS.					
M&S BOE:		M&S BO	DE:										

Labor BOE: N/A

WBS							Cost	M	S FNAL L	abor M&S	Cont. Labo	or Level
1.3.5.6.3		install and	test one pro	ototype mac	hine		\$0	\$	0 \$0		0 0.5	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	8	StudentU	100%	80 hrs	0 days	8/2/05	8/15/05	\$0	\$0	\$0	\$0	
	14	PostDoc	20%	16 hrs	0 days	8/2/05	8/15/05	\$0	\$0	\$0	\$0	

Notes

WBS Description:

To insure that the machines perform to the specifications and to download the appropriate software they are installed and tested at Fermilab. The prototype is sent back to the vendor for cloning.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.5.6.5 Arrival of 140/20 PCs from the vendor \$0 \$0 \$0 0 0 2

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the installation of 140 Level 3 PCs and 20 DAQ PC's.

,			built in pi	lasc			ΨΟ	Ψ	ΨΟ		0.5
Г	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
	8	StudentU	50%	40 hrs	0 days	8/16/05	8/29/05	\$0	\$0	\$0	\$0

Notes

1.3.5.6.6

WBS Description:

In the burn in phase the PCs are running under load to find potential problems. The vendor is responsible to replace failing hardware in due time.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.5.6.7 installation into the DAQ system \$0 \$0 \$0 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	40 hrs	0 days	8/30/05	9/6/05	\$0	\$0	\$0	\$0
14	PostDoc	20%	8 hrs	0 days	8/30/05	9/6/05	\$0	\$0	\$0	\$0

Notes

WBS Description:

WBS		Name				Cost	M&S	FNAL La	bor M&S	Cont. L	₋abor	Level
nstallation into	the DAQ system" contin	ued										
N	lotes											
The	e installation of the nodes in	to their final loca	ation should b	e rather smo	ooth since the	e environment v	vill be well pr	epared.				
M&S	S BOE: N/A											
	oor BOE: sed upon experience with th	e Run 2a syster	m.									
	Finish Purchase Notes S Description:	of Computers	for Level3/D	DAQ system	n	\$0	\$0	\$0	0		0	2
This	is milestone marks the end of	of the PC purcha	ases for the D	AQ and the	Level3 PC Fa	arm.						
1.3.6 <i>N</i>	Votes 3S Description:	SVT upgra	ade		,	\$267,520	\$186,1	20 \$81,40	0		0	0
1.3.6 <u>N</u> WB	3S Description: F Silicon Vertex Tracker Ru	n 2b upgrade. l	Upgrade nece	essary due to	o differences	between SVX I	la and SVX I	lb detector geometry.	System operat	tion identical t	to the Rur	ı 2a SVT.
1.3.6 <u>N</u> WB CDF	3S Description: PF Silicon Vertex Tracker Ru Do	n 2b upgrade. l	Upgrade nece	essary due to	o differences	between SVX I \$81,400	la and SVX II	lb detector geometry.	System operat	tion identical t	to the Rur	0 2a SVT.
1.3.6 <u>MB</u> CDF 1.3.6.1 1.3.6.1.1	3S Description: PF Silicon Vertex Tracker Ru Do	n 2b upgrade. Uesign and Sin	Upgrade nece mulation I Warrior	essary due to	o differences	between SVX I \$81,400 \$0	la and SVX II \$0 \$0	lb detector geometry. \$81,40	System operation of the control of t	tion identical t	to the Rur	0 0
1.3.6	3S Description: OF Silicon Vertex Tracker Ru Description:	n 2b upgrade. l	Upgrade nece mulation I Warrior	essary due to	o differences	between SVX I \$81,400	la and SVX II	lb detector geometry.	System operat	tion identical t	to the Rur	0 2a SVT.
1.3.6	3S Description: PF Silicon Vertex Tracker Ru Do	n 2b upgrade. Uesign and Sin MS and Road Design Pha	Upgrade nece mulation I Warrior ase	essary due to	o differences	between SVX I \$81,400 \$0	la and SVX II \$0 \$0	lb detector geometry. \$81,40	System operation of the control of t	tion identical t	to the Rur	0 0
1.3.6	BS Description: OF Silicon Vertex Tracker Ru Do Al	n 2b upgrade. Uesign and Sin MS and Road Design Pha	Upgrade nece mulation I Warrior ase 29 June)	essary due to	o differences	between SVX I \$81,400 \$0	la and SVX II \$0 \$0	lb detector geometry. \$81,40	System operation of the control of t	tion identical t	to the Rur	0 0
1.3.6 WB CDF 1.3.6.1 1.3.6.1.1 1.3.6.1.1.1 Note: The control of the control	Do Resource Name	n 2b upgrade. Uesign and Sin MS and Road Design Pha i's review talk (2 Board simula	Upgrade nece mulation I Warrior ase 29 June)	essary due to	o differences	\$81,400 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0	\$81,40 \$0 \$0 \$0 Baseline Cost	System operation of the system operation operation of the system operation operati	tion identical t	0 0 0 0	0 0 0
1.3.6 WB CDF 1.3.6.1 1.3.6.1.1 1.3.6.1.1.1 None in the control of the contr	Description: Description: Description: Description: Description: Description: Description: Description: All Motes ration estimate from A. Cerr	n 2b upgrade. Uesign and Sin MS and Road Design Pha i's review talk (2	Upgrade nece mulation I Warrior ase 29 June)		o differences	\$81,400 \$0 \$0 \$0	\$0 \$0 \$0 \$0	\$81,40 \$0 \$0	System operation of the control of t	tion identical t	o the Rur	0 0 0
1.3.6 No WB CDF 1.3.6.1 1.3.6.1.1 1.3.6.1.1.1 No Duri	Do Resource Name PostDocU	n 2b upgrade. Uesign and Sin WS and Road Design Pha I's review talk (2 Board simula Units 10%	Upgrade nece mulation I Warrior lase 29 June) lation Work 64 hrs	Delay	o differences	\$81,400 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0	\$81,40 \$0 \$0 \$0 Baseline Cost	System operation of the system operation operation of the system operation operati	tion identical t	0 0 0 0	0 0 0
1.3.6 No WB CDF 1.3.6.1 1.3.6.1.1 1.3.6.1.1.1 No Duri	Do Resource Name PostDocU	n 2b upgrade. Uesign and Sin WS and Road Design Pha I's review talk (2 Board simula Units 10%	Upgrade nece mulation I Warrior lase 29 June) lation Work 64 hrs	Delay	o differences	\$81,400 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0	\$81,40 \$0 \$0 \$0 Baseline Cost	System operation of the system operation operation of the system operation operati	tion identical t	0 0 0 0	0 0 0
1.3.6 No WB CDF 1.3.6.1 1.3.6.1.1 1.3.6.1.1.1 No Duri	Do Resource Name PostDocU	n 2b upgrade. Uesign and Sin WS and Road Design Pha I's review talk (2 Board simula Units 10%	Upgrade nece mulation I Warrior ase 29 June) lation Work 64 hrs	Delay	o differences	\$81,400 \$0 \$0 \$0 \$0 Finish 12/22/04	\$0 \$0 \$0 \$0 \$0	\$81,40 \$0 \$0 \$0 Baseline Cost	System operation of the system operation operation of the system operation operati	tion identical t	0 0 0 0	0 0 0
1.3.6 NWB CDF 1.3.6.1 1.3.6.1.1 1.3.6.1.1.1 NWDurn 1.3.6.1.1.2	Do Resource Name 7 PostDocU Notes Taken A. Cerr	n 2b upgrade. Upsign and Sin MS and Road Design Phasis review talk (2) Board simulated Units 10%	Upgrade nece mulation I Warrior ase 29 June) lation Work 64 hrs	Delay	o differences	\$81,400 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$81,40 \$0 \$0 \$Baseline Cost \$0	System operation of the system operation operation of the system operation of the system operation operation of the system operation operation operation operation operation of the system operation	tion identical t	0 0 0 0 0 <u>st</u>	0 0 0

Duration estimate from A. Cerri's review talk (29 June)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.6.1.1.4	L3 AMS Firmware Complete	\$0	\$0	\$0	0	0	3
1.3.6.1.1.5	AMS Firmware Complete	\$0	\$0	\$0	0	0	2
1.3.6.1.1.6	L3 Begin AMS Design Work	\$0	\$0	\$0	0	0	3
1.3.6.1.1.7	Begin AMS Design Work	\$0	\$0	\$0	0	0	2
1.3.6.1.2	Hit Buffer	\$81,400	\$0	\$81,400	0	0	0
1.3.6.1.2.1	Design Phase	\$0	\$0	\$0	0	0	0

0

0

0

Notes

Duration estimate from A. Cerri's review talk (29 June)

1.3.6.1.2.2 Board simulation \$0 \$0 \$0 ID Resource Name Units Work Start Finish Cost Baseline Cost Act. Cost Rem. Cost Delav PostDocU 10% 80 hrs 9/1/04 1/28/05 \$0 \$0 \$0 \$0 0 days

Notes

Duration estimate from A. Cerri's review talk (29 June)

1.3.6.1.2.3 Firmware \$81,400 \$0 \$81,400 0 0 Finish Baseline Cost Act. Cost Rem. Cost Resource Name Units Work Delay Start Cost ElecEngF 1,480 hrs 1/7/05 9/28/05 \$81,400 \$52,800 \$0 \$81,400 4 100% 0 days 7 **PostDocU** \$0 \$0 10% 148 hrs 0 days 1/7/05 9/28/05 \$0 \$0

Notes

Duration estimate from A. Cerri's review talk (29 June)

1.3.6.1.2.4 L3 Hit Buffer Firmware Complete \$0 3 Hit Buffer Firmware Complete \$0 \$0 \$0 2 1.3.6.1.2.5 1.3.6.1.3 **Track Fitter** \$0 \$0 \$0 0 0 1.3.6.1.3.1 Design Phase \$0 \$0 \$0 0 0

Notes

Duration estimate from A. Cerri's review talk (29 June)

1.3.6.1.3.2 \$0 \$0 Board simulation Resource Name Units Work Delav Start Finish Cost Baseline Cost Act. Cost Rem. Cost PostDocU 8/30/04 1/11/05 \$0 \$0 10% 72 hrs 0 days \$0 \$0

Notes

Duration estimate from A. Cerri's review talk (29 June)

WBS			Nam	9			Cost	Λ	1&S	FNAL L	abor M8	ks C	ont. Labor	Level
1.3.6.1.3.3			Firmwa	are			\$0		\$0	\$0		0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Bas	seline Cost	Act. Cost		Rem. Cost	
	7	PostDocU	25%	280 hrs	0 days	8/9/04	3/2/05	\$0		\$0	\$0		\$0	
	8	StudentU	50%	560 hrs	0 days	8/9/04	3/2/05	\$0		\$0	\$0	' _	\$0	
į	Notes Duration	s n estimate from A. Cerri'	s review talk	(29 June)										
1.3.6.1.3.4		L3 Tracl	k Fitter Firm	ware Compl	ete		\$0		\$0	\$0		0	0	3
1.3.6.1.3.5		Track	Fitter Firmw	are Complet	е		\$0		\$0	\$0		0	0	2
1.3.6.1.3.6				itter Design			\$0		\$0	\$0		0	0	3
1.3.6.1.3.7			gin Track Fi				\$0		\$0	φο \$0		0	0	2
1.3.6.1.4			_							\$0 \$0		0	0	0
		AS	sociative N	_			\$0		\$ 0	-		_	-	-
1.3.6.1.4.1	Notes		Design P	hase			\$0		\$0	\$0		0	0	0
3.6.1.4.2 ا			Board sim				\$ 0		\$0	\$0		0	0	0
	ID 7	Resource Name PostDocU	Units 10%	Work 60 hrs	Delay 0 days	Start 9/30/04	Finish 1/21/05	Cost \$0		aseline Cost \$0	Act. Cost	0	Rem. Cost \$0	
Į	Notes		1070	001110	o dayo	0/00/01	1/2 1/00	ΨΟ		ΨΟ	Ψ	<u> </u>	ΨΟ	
i		estimate from A. Cerri'	s review talk	(29 June)										
1.3.6.1.4.3			Firmwa	are			\$0		\$0	\$0		0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish			Baseline Cost			Rem. Cost	
		PostDocU	100%	160 hrs	0 days	12/29/0	4 1/28/	05	\$0	\$	0	\$0	\$6)
	7	1 OSIBOCO			U days		1							
	Notes		•		O days	,	•		•					
Ī	Notes		•		_ o days									
	Notes	estimate from A. Cerri	's review talk	(29 June)	o days			\$ 100)	0 00				
1.3.6.2	Notes	n estimate from A. Cerri'	s review talk	(29 June)	o days	4	§186,120		36,120			0	0	0
1.3.6.2 1.3.6.2.1	Notes Duration	n estimate from A. Cerri Ha	s review talk rdware Cor IS and Roa	(29 June) struction d Warrior	i cuays	4	\$186,120 \$33,360	\$3	3,360	\$0		0	0	0
1.3.6.2	Notes Duration	Ha AN Mez	s review talk rdware Cor IS and Roa	(29 June)	T Guaya	4	§186,120	\$3		\$0			_	_

RAM 2 is 512K x 24 bit memory

zanine		(RAM 1)" continued										
	Notes											
	Hit buffe	r uses 1 RAM 1 + 1 RAI	M 2 cards									
	AMS use	es 1 RAM 1 + 1 RAM 2 o	cards									
	Track Fi	tter uses 2 RAM 1 + 2 R	AM 2 cards									
	This mea	ans we need 48 of each	plus 12 spare	S.								
6.2.1.1	1		Design			\$17	,600	\$17,600	\$0	0	0	0
0.2	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cos			
	12	MANDSPASSL	17,600	17,600		10/5/04	11/10/04			\$0 \$17,60		SO
	17	ENG UNIV	100%	400 hrs		9/1/04	11/10/04		\$0	\$0		30
	34	Tang	100%	400 hrs	0 days	9/1/04	11/10/04	!	\$0	\$0	\$0 \$	30
	Notes											
	Based o	n 100% of Tang's time f	or 6 weeks. Ir	-Kind contrib	ution from UC.							
6.2.1.1	.2		Production	on		\$14	,000	\$14,000	\$0	0	0	
v. <u>-</u>						Ψιτ	,000	Ψ11,000	ΨΟ	U	0	0
٠. <u>८</u> . ۱. ۱	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	7
V. <u>C</u> . 1. 1	<i>ID</i> 10	Resource Name MANDSPASS	Units 14,000		Delay 0 days		-		Baseline Cost	Act. Cost	Rem. Cost	
	10 Notes	MANDSPASS	14,000	Work 14,000	0 days	Start 11/11/04	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	10 Notes	MANDSPASS	14,000	Work 14,000	0 days	Start 11/11/04	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	10 Notes	MANDSPASS	14,000	Work 14,000	0 days	Start 11/11/04	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	10 Notes M&S est	MANDSPASS	14,000	Work 14,000 (29 June) -	0 days	Start 11/11/04 0 each	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	10 Notes M&S est	MANDSPASS imate: From Mel Shoch	14,000 et's review talk Testing Units	Work 14,000 (29 June) -	0 days	Start 11/11/04 0 each \$1,	Finish 5/20/05 760 Finish	\$1,760 Cost	Baseline Cost \$2,800 \$0 \$0 Baseline Cost	Act. Cost 0 \$3,500 0	Rem. Cost 0 \$10,500 0 Rem. Cost	
	.3 ID 12	MANDSPASS imate: From Mel Shoch Resource Name MANDSPASSL	14,000 et's review talk Testing Units 1,760	Work 14,000 (29 June) -	0 days 14 boards * \$20 Delay 0 days	Start 11/11/04 0 each \$1, Start 12/13/04	760 Finish 1/28/05	\$1,760 Cost \$1,760	\$0 \$2,800 \$0 \$0 \$aseline Cost	0 Act. Cost 0 \$3,500	Rem. Cost 0 \$10,500 Rem. Cost \$1,056	
	.3 ID 12 17	MANDSPASS imate: From Mel Shoch Resource Name MANDSPASSL ENG UNIV	14,000 et's review talk Testing Units 1,760 10%	Work 14,000 (29 June) - Work 1,760 24 hrs	0 days 14 boards * \$20 Delay 0 days 0 days 0 days	Start 11/11/04 0 each \$1, Start 12/13/04 12/13/04	760 Finish 1/28/05 1/28/05	\$1,760 \$1,760 Cost \$1,760 \$0	\$0 \$2,800 \$0 \$0 \$aseline Cost \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	0 Act. Cost 0 \$3,500 Act. Cost \$704 \$0	Rem. Cost 0 \$10,500 Rem. Cost \$1,056 \$0	
	.3 ID 12 17 34	MANDSPASS imate: From Mel Shoch Resource Name MANDSPASSL ENG UNIV Tang	14,000 et's review talk Testing Units 1,760	Work 14,000 (29 June) -	0 days 14 boards * \$20 Delay 0 days	Start 11/11/04 0 each \$1, Start 12/13/04	760 Finish 1/28/05	\$1,760 Cost \$1,760	\$0 \$2,800 \$0 \$0 \$aseline Cost	0 Act. Cost 0 \$3,500	Rem. Cost 0 \$10,500 Rem. Cost \$1,056	
6.2.1.1	.3 ID 12 17 34 Notes Notes Notes Notes	MANDSPASS imate: From Mel Shoch Resource Name MANDSPASSL ENG UNIV Tang	14,000 et's review talk Testing Units 1,760 10% 10%	Work 14,000 (29 June) - Work 1,760 24 hrs 24 hrs	0 days 14 boards * \$20 Delay 0 days 0 days 0 days 0 days	Start 11/11/04 0 each \$1, Start 12/13/04 12/13/04	760 Finish 1/28/05 1/28/05	\$1,760 \$1,760 Cost \$1,760 \$0	\$0 \$2,800 \$0 \$0 \$aseline Cost \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	0 Act. Cost 0 \$3,500 Act. Cost \$704 \$0	Rem. Cost 0 \$10,500 Rem. Cost \$1,056 \$0	
6.2.1.1	.3 ID 12 17 34 Notes Based o	MANDSPASS imate: From Mel Shoch Resource Name MANDSPASSL ENG UNIV Tang n 10% of Tang's time fo	14,000 Testing Units 1,760 10% 10% 10%	Work 14,000 (29 June) - Work 1,760 24 hrs 24 hrs	O days 14 boards * \$20 Delay O days O days O days O days oution from UC.	Start 11/11/04 0 each \$1, Start 12/13/04 12/13/04 12/13/04	760 Finish 1/28/05 1/28/05	\$1,760 \$1,760 Cost \$1,760 \$0	\$0 \$2,800 \$0 \$0 \$aseline Cost \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	0 Act. Cost 0 \$3,500 Act. Cost \$704 \$0	Rem. Cost 0 \$10,500 Rem. Cost \$1,056 \$0	
6.2.1.1	.3 .3 .1D .12 .17 .34 .Notes .Based o	MANDSPASS imate: From Mel Shoch Resource Name MANDSPASSL ENG UNIV Tang n 10% of Tang's time fo	14,000 Testing Units 1,760 10% 10% 10%	Work 14,000 (29 June) - Work 1,760 24 hrs 24 hrs 1-Kind contrib	O days 14 boards * \$20 Delay O days O days O days O days Uttion from UC.	Start 11/11/04 0 each \$1, Start 12/13/04 12/13/04 12/13/04	Finish 5/20/05 760 Finish 1/28/05 1/28/05 1/28/05	\$1,760 Cost \$1,760 \$0 \$0	\$0 \$2,800 \$0 \$2,800 \$0 Baseline Cost \$0 \$0 \$0 \$0	0 Act. Cost 0 Act. Cost \$704 \$0 \$0 \$0	0 Rem. Cost 0 \$10,500 Rem. Cost \$1,056 \$0 \$0	0

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level	
1.3.6.2.2.1	Mezzanine Cards (RAM 2)	\$33.360	\$33,360	\$0	0	0	0	

Notes

RAM 1 is 4 M x 48 bit memory

RAM 2 is 512K x 24 bit memory

Hit buffer uses 1 RAM 1 + 1 RAM 2 cards

AMS uses 1 RAM 1 + 1 RAM 2 cards

Track Fitter uses 2 RAM 1 + 2 RAM 2 cards

This means we need 48 of each plus 12 spares.

1.3.6.2.2.1.	.1		Design			\$17,	600	\$17,600	\$0	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	12	MANDSPASSL	17,600	17,600	0 days	12/13/04	2/4/05	\$17,600	\$0	\$0	\$17,600	
	17	ENG UNIV	100%	280 hrs	0 days	12/13/04	2/4/05	\$0	\$0	\$0	\$0	
	21	Tana	100%	280 hrs	0 days	12/13/04	2/4/05	Φ Ω	ΦΩ	\$0	\$0	

Notes

Based on 100% of Tang's time for 6 weeks. In-Kind contribution from UC.

1.3.6.2.2.1.			Productio	n		\$	14,000	\$14,000	\$0	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	10	MANDSPASS	14.000	14.000	0 davs	2/7/05	4/29/05	\$14.000	\$4.200	\$0	\$14.000	

Notes

M&S estimate: From Mel Shochet's review talk (29 June) - 14 boards * \$100 each + M&S estimate: From Mel Shochet's review talk (29 June) - 14 boards * \$200 each

1.3.6.2.2.1.	.3		Testing	9			\$1,760	\$1,76	0 \$0	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	12	MANDSPASSL	1,760	1,760	0 days	3/7/05	4/15/05	\$1,760	\$0	\$0	\$1,760	
	17	ENG UNIV	10%	24 hrs	0 days	3/7/05	4/15/05	\$0	\$0	\$0	\$0	
	34	Tang	10%	24 hrs	0 days	3/7/05	4/15/05	\$0	\$0	\$0	\$0	

Notes

Based on 10% of Tang's time for 12 weeks. In-Kind contribution from UC.

1.3.6.2.2.2 Transition Cards \$4,600 \$4,600 \$0 0 0

WBS			Name				Cost	M	S FNAL I	_abor M&S	Cont. Labor	Level
1.3.6.2.2.2.	1		Desigr)			\$220	\$2	20 \$0)	0 0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
•	12	MANDSPASSL	220	220	0 days	3/7/05	3/11/05	\$220	\$0	\$0	\$220	
	17	ENG UNIV	50%	20 hrs	0 days	3/7/05	3/11/05	<i>\$0</i>	<i>\$0</i>	\$0	\$0	
	34	Tang	50%	20 hrs	0 days	3/7/05	3/11/05	\$0	\$0	\$0	\$0	
	Notes											
Ī	Based o	n 50% of Tang's time fo	r 1 week. In-l	Kind contribu	tion from UC.							
.3.6.2.2.2.2	2		Producti	on			\$3,500	\$3,	500 \$0)	0 0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	10	MANDSPASS	3,500	3,500	0 days	3/14/05	4/8/05	\$3,500	\$3,500	\$(9 \$3,500	
.3.6.2.2.2.		imate: From Mel Shoch	et's review tal Testing	,	14 boards * \$2	250 each	\$880	\$8	80 \$C		0 0	0
۵.۷.۷.۷.۷.	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	U
-	12	MANDSPASSL	880	880	0 days	4/11/05	5/6/05	\$880	\$0	\$0	\$880	
	17	ENG UNIV	10%	16 hrs	0 days 0 days	4/11/05	5/6/05	\$000 \$0	\$0 \$0	\$0	\$0	
	34	Tang	10%	16 hrs	0 days	4/11/05	5/6/05	\$0	\$0	\$0	\$0	
ī 1.3.6.2.2.3		n 10% of Tang's time fo	r 1 month. In		ution from UC.		\$57,400	\$57,	400 \$0		0 0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Co	st Act. Co	ost Rem. Cost	
•	10	MANDSPASS	57,400	57,400	0 days	1/31/0	5 6/6/05	\$57,4	400 \$57,	400	\$0 \$57,40	0
-	Notes											
,	We need	d 12 boards (plus 2 spar	•		at \$4,100 eac	h in FY04 do						
,	We need	d 12 boards (plus 2 spar Te	est Hit Buffer	System			\$0	\$	0 \$0		0 0 Rem Cost	0
,	We need	1 12 boards (plus 2 spar Te Resource Name	est Hit Buffer <i>Unit</i> s	System Work	Delay	Start	\$0 Finish	\$ Cost	0 \$0 Baseline Cost	Act. Cost	Rem. Cost	0
1.3.6.2.2.4	We need	d 12 boards (plus 2 spar Te	est Hit Buffer Units 100%	System Work 320 hrs		Start 7/6/05	\$0 Finish 8/30/05	\$ Cost \$0	0 \$0 Baseline Cost \$0	Act. Cost	Rem. Cost	
	We need	1 12 boards (plus 2 spar Te Resource Name	est Hit Buffer <i>Unit</i> s	System Work 320 hrs	Delay	Start 7/6/05	\$0 Finish	\$ Cost	0 \$0 Baseline Cost \$0	Act. Cost	Rem. Cost	0
1.3.6.2.2.4	We need	12 boards (plus 2 spar Te Resource Name PhysicistU	est Hit Buffer Units 100%	System Work 320 hrs	Delay	Start 7/6/05	\$0 Finish 8/30/05	\$ Cost \$0	0 \$0 Baseline Cost \$0 400 \$0	Act. Cost	Rem. Cost	

RAM 2 is 512K x 24 bit memory

Mezzanine Cards (RAM 2)* continued **Notes **Hit buffer uses 1 RAM 1 + 1 RAM 2 cards **AMS uses 1 RAM 1 + 1 RAM 2 cards **Track Filter uses 2 RAM 1 + 2 RAM 2 cards **Track Filter uses 2 RAM 1 + 1 RAM 2 cards **Track Filter uses 2 RAM 1 + 1 RAM 2 cards **Track Filter uses 2 RAM 1 + 1 RAM 2 cards **Track Filter uses 2 RAM 1 + 1 RAM 2 cards **Track Filter uses 2 RAM 1 + 1 RAM 2 cards **Track Filter uses 2 RAM 1 + 1 RAM 2 cards **Track Filter uses 2 RAM 1 + 1 RAM 2 cards **Track Filter uses 2 RAM 1 + 1 RAM 2 cards **Track Filter uses 2 RAM 1 + 1 RAM 2 Cards **Track Filter uses 2 RAM 1 + 1 RAM 2 Cards **Track Filter uses 2 RAM 1	WBS			Name			(Cost	M&S	FNAL Lab	oor M&S Con	nt. Labor	Level
AMS uses 1 RAM1 + 1 RAM2 cards Track Fitter uses 2 RAM1 + 2 RAM2 cards This means we need 48 of each plus 12 spares. All resources and schedule have been moved to 1.3.6.2.2.1 1.3.6.2.3.1.1 Design \$0 \$0 \$0 0 0 0 Notes Same as 1.3.6.2.2.1.1 1.3.6.2.3.1.2 Production \$0 \$0 \$0 \$0 0 0 0 Notes M&S estimate: From Mel Shochet's review talk (29 June) - 28 boards '\$ \$750 each Same as 1.3.6.2.2.1.2 1.3.6.2.3.1.3 Testing \$0 \$0 \$0 0 0 0 0 Notes Same as 1.3.6.2.2.1.3 1.3.6.2.3.2 Pulsar Boards \$57.400 \$57.400 \$0 0 0 0 Notes Same as 1.3.6.2.2.1.3 1.3.6.2.3.5 Pulsar Boards \$57.400 \$57.400 \$57.400 \$0 0 0 0 Notes M&S estimate: From Mel Shochet's review talk (29 June) - 28 boards '\$ \$57.400 \$57.400 \$0 0 0 0 Notes Same as 1.3.6.2.2.1.3 1.3.6.2.3.1.3 Testing \$0 \$57.400 \$57.400 \$0 0 0 0 Notes M&S BOBE: We need 12 boards (plus 2 spares) for a total of 14 boards at \$4,100 each in FY04 dollars. See item 1.3.11.8.5. 1.3.6.2.5 Test of AMS and Road Warrior \$0 \$0 \$0 \$0 0 0 0 I/D Resource Name Units Work Delay Start Finish Cost Baseline Cost Act Cost Rem. Cost Delay Start Finish Cost Baseline Cost Act Cost Rem. Cost Start Finish Cost Baseline Cost Act Cost Rem. Cost Start Finish Cost Baseline Cost Act Cost Start Finish Cost Start Finish Cost Baseline Cost Act Cost Start Finish Cost Start Finish Cost Baseline Cost Act Cost Start Finish Cost Baseline Cost Act Cost Start Finish Cost Baseline Cost Act Cost Rem. Cost Start Finish Cost Baseline Cost Act Cost Rem. Cost Start Finish Cost Baseline Cost Act Cost Rem. Cost Start Finish Cost Baseline Cost Act Cost Rem. Cost Start Finish Cost Baseline Cost Act Cost Rem. Cost Start Finish Cost Baseline Cost Act Cost Rem. Cost Start Finish Cost Rem. Cost Start Finish Cost Baseline Cost Act Cost Rem. Cost St	"Mezzanine		RAM 2)" continued										
Track Filter uses 2 RAM 1 + 2 RAM 2 cards This means we need 48 of each plus 12 spares. All resources and schedule have been moved to 1.3.6.2.2.1 1.3.6.2.3.1.1 Design \$0 \$0 \$0 0 0 0 Notes Same as 1.3.6.2.2.1.1 1.3.6.2.3.1.2 Production \$0 \$0 \$0 \$0 0 0 0 Notes MAS sestimate: From Met Shochet's review talk (29 June) - 28 boards * \$750 each Same as 1.3.6.2.2.1.2 1.3.6.2.3.1.3 Testing \$0 \$0 \$0 0 0 0 0 Notes Same as 1.3.6.2.2.1.3 1.3.6.2.3.1 Testing \$0 \$0 \$0 \$0 0 0 0 Notes Same as 1.3.6.2.2.1.3 1.3.6.2.3.2 Pulsar Boards \$57,400 \$57,400 \$0 0 0 0 Notes 10 MANDSPASS \$7,400 \$7,400 \$57,400 \$0 \$0 \$57,400 \$57	1	Hit buffe	uses 1 RAM 1 + 1 RAM	/ 2 cards									
This means we need 48 of each plus 12 spares. All resources and schedule have been moved to 1.3.6.2.2.1 1.3.6.2.3.1.1 Design \$0 \$0 \$0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	,	AMS use	s 1 RAM 1 + 1 RAM 2 (cards									
All resources and schedule have been moved to 1.3.6.2.2.1.1 1.3.6.2.3.1.1 Design \$0 \$0 \$0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Track Fit	ter uses 2 RAM 1 + 2 R	AM 2 cards									
1.3.6.2.3.1.1 Design \$0 \$0 \$0 \$0 0 0 0 0 0 0 0 0 0 0 0 0 0	-	This mea	ins we need 48 of each	plus 12 spare	3.								
Notes Same as 1.3.6.2.2.1.1		All resou	irces and schedule ha	ve been move	ed to 1.3.6.2.	2.1							
1.3.6.2.3.1.2	1.3.6.2.3.1.	1		Design				\$0	\$0	\$0	0	0	0
1.3.6.2.3.1.2	;		1362211										
Notes M&S estimate: From Mel Shochet's review talk (29 June) - 28 boards * \$750 each			1.0.0.2.2.1.1	Droduotio	n			¢ሰ	ው	¢Λ	0	0	0
Same as 1.3.6.2.2.1.2	1.3.0.2.3.1.			Productio)T1			ΦΟ	Φυ	Φ0	U	U	U
1.3.6.2.3.1.3 Testing \$0	Ī	M&S est	mate: From Mel Shoche	et's review talk	(29 June) - 2	8 boards * \$7	50 each						
Notes Same as 1.3.6.2.2.1.3 Same as 1.3.6.2.2.1.3	,	Same as	1.3.6.2.2.1.2										
1.3.6.2.3.2 Pulsar Boards \$57,400 \$57,400 \$0 0 0 0 0 0 0 0 0	1.3.6.2.3.1.3	3		Testing				\$0	\$0	\$0	0	0	0
1.3.6.2.3.2 Pulsar Boards \$\$57,400 \$\$57,400 \$\$0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	-		1362213										
ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost 10 MANDSPASS 57,400 57,400 0 days 1/31/05 6/6/05 \$57,400 \$57,400 \$0 \$57,400 \$57,400 \$0 \$57,400 \$0 \$57,400 \$0 \$0 \$0 \$0 \$0 \$0 \$0			1.0.0.2.2.1.0	Dulcar Boo	rde		ФE		¢57.40	0 \$0	0	0	0
10 MANDSPASS 57,400 57,400 0 days 1/31/05 6/6/05 \$57,400 \$57,400 \$0 \$57,400 \$0 \$57,400 \$0 \$57,400 \$0 \$0 \$0 \$0 \$0 \$0 \$0	1.3.0.2.3.2		Resource Name			Delav							7
M&S BOE: We need 12 boards (plus 2 spares) for a total of 14 boards at \$4,100 each in FY04 dollars. See item 1.3.11.8.5. 1.3.6.2.5 Test of AMS and Road Warrior \$0 <td< td=""><td></td><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>		10											
We need 12 boards (plus 2 spares) for a total of 14 boards at \$4,100 each in FY04 dollars. See item 1.3.11.8.5. 1.3.6.2.5 Test of AMS and Road Warrior \$0	.												
1.3.6.2.5 Test of AMS and Road Warrior \$0 \$0 \$0 0 0 0 ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost 6 PhysicistU 100% 160 hrs 0 days 4/18/05 5/13/05 \$0 \$0 \$0 \$0 1.3.6.2.6 Associative Memory ++ \$0 \$0 \$0 0 0 0 1.3.6.2.6.1 Test prototype Amchip, Lamb, Amboard \$0 \$0 \$0 0 0 0													
ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost 6 PhysicistU 100% 160 hrs 0 days 4/18/05 5/13/05 \$0 \$0 \$0 1.3.6.2.6 Associative Memory ++ \$0 \$0 \$0 0 0 1.3.6.2.6.1 Test prototype Amchip, Lamb, Amboard \$0 \$0 \$0 0 0		We need					in FY04 dolla						
6 PhysicistU 100% 160 hrs 0 days 4/18/05 5/13/05 \$0 \$0 \$0 \$0 1.3.6.2.6 Associative Memory ++ \$0 \$0 \$0 0 0 0 1.3.6.2.6.1 Test prototype Amchip, Lamb, Amboard \$0 \$0 \$0 0 0 0	1.3.6.2.5	10					C4 a m4	-		•			0
1.3.6.2.6.1 Test prototype Amchip, Lamb, Amboard \$0 \$0 0 0													
1.3.6.2.6.1 Test prototype Amchip, Lamb, Amboard \$0 \$0 0 0	1.3.6.2.6		Ass	ociative Me	morv ++			\$0	\$0	\$0	0	0	0
					_	oard				-	-	-	-
1.3.6.2.6.2 Production of Amchip, Lamb, Amboard \$0 \$0 \$0 0 0	1.3.6.2.6.2		-					\$0	\$0	\$0	0	0	0

WBS			Name				Cost	M	&S FNAL	Labor M&S	S Cont.	Labor	Level
"Production	of Amc	nip, Lamb, Amboard" (continued										
1.3.6.2.6.	.3	L3 Be	gin Ampchip	Production			\$0	9	iO \$()	0	0	3
1.3.6.2.6.	.4	Begi	n Ampchip	Production			\$0	9	io \$()	0	0	2
1.3.6.2.7	7		Test Track	Fitter			\$0	9	60 \$()	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Co		
	6	PhysicistU	100%	160 hrs	0 days	6/7/05	7/5/05	\$0	\$0	\$0		\$0	
1.3.6.3			Γ ready for i	nstallation			\$0	\$	50 \$6)	0	0	2
	Note:	escription:											
		ne denoting the completion	on of the SVT										
1.3.6.4	WillColo	-					<u></u>	4	φ.				
1.3.6.4				installation	~ 4		\$0 \$0		60 \$(60 \$(0	0	3
1.3.8	Notes		un 26 Trigge	er DAQ proje	Ct		Φ0	1	0U \$1	J	U	U	2
		escription:											
	Milesto	ne marking the end of the	e CDF Run 2b	Trigger/DAQ	upgrade subp	roject.							
1.3.9		Data Acquisition ar	nd Trigger U	pgrades Rea	dy To Instal	l	\$0	9	io \$()	0	0	2
	Notes				,		·						
	WBS D	escription:											
	Milesto	ne marking the end of the	e CDF Run 2b	Trigger/DAQ	upgrade subp	project. This	milestone is c	oupled to th	ne corresponding leve	el 2 milestone wi	th added sch	edule conting	ency.
1.3.10		Accelerator "Su	mmar" Shu	tdown plon	sina taaba		\$ 0	d	iO \$(n	0	0	0
1.3.10.1			lerator Shut		iiiiy tasks		\$0 \$0		50 \$(0	0	0
1.3.10.1	Note		lerator Shut	uowii 2004			φυ	4	Ю Ф	J	U	U	U
		escription:											
	Planni	ng task to Cover 3 month	accelerator	shutdown in 20	004.								
1.3.10.2)	Acce	lerator Shut	down 2005			\$0	9	iO \$()	0	0	0
1.0.10.2	Notes	3	.5.4.5. 5.74	25 2000			ΨΟ	4	Ψ	-	-	Ü	•
	WBS D	escription:											

Planning task to Cover 3 month accelerator shutdown in 2004.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.10.3	L3 MS: 2004 Shutdown Complete	\$0	\$0	\$0	0	0	3
1.3.11	Revised XFTII Project	\$1,341,050	\$1,150,393	\$190,657	0	0	0
Notes WBS Descri	ption:						
Project to Up	ograde the CDF Level 1 tracking trigger system.						
1.3.11.1	L3 Start of Revised XFTII Project	\$0	\$0	\$0	0	0	3
Notes WBS Descri	ption:						
Milestone - r	marking the start of the XFTII upgrade project.						
1.3.11.2	Finder Boards	\$660,479	\$488,600	\$171,879	0	0	0
Notes WBS Descri	ption:						

Development of axial and stereo segment Finder boards. These boards take hit information from the COT and find track segments in the COT superlayers.

1.3.11.2.1		Finde	r system s	pecification		\$5,72	<u>?</u> 0	\$0	\$5,720	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	4	ElecEngF	20%	104 hrs	0 days	6/1/04	8/31/04	\$5,720	\$5,720	\$5,720	\$0	
	23	Shaw	20%	26 hrs	49.75 days	8/10/04	9/1/04	\$0	\$0	<i>\$0</i>	\$0	

Notes

WBS Description:

Finder System Specification: This task will include design specification and draft report on the Finder board implementation.

M&S BOE: N/A

Labor BOE: 50% FNAL Engineer (T. Shaw) for 4.2 weeks

1.3.11.2.2		Finder Board FP0	GA Firmwa	re developmen	t (FNAL)	\$45,7	760	\$0	\$45,760	0	0.5	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	4	ElecEngF	40%	832 hrs	0 days	6/15/04	6/27/05	\$45,760	\$45,760	\$24,464	\$21,296	
	24	Holm	40%	748.8 hrs	26 days	7/22/04	6/27/05	\$0	\$0	\$0	\$0	

Notes

WBS Description:

Finder Board FPGA Firmware development (FNAL). This work will include development of Finder chip firmware, VMEbus slave interface and various control algorithms.

WBS Name Cost M&S **FNAL Labor** M&S Cont. Labor

"Finder Board FPGA Firmware development (FNAL)" continued

Notes

M&S BOE: N/A

Labor BOE: Resource: 40% FNAL Engineer (S. Holm)

1.3.11.2.3 Finder Board FPGA Firmware development (OSU) \$0 0 Finish Resource Name Units Work Delav Start Cost Baseline Cost Act. Cost Rem. Cost PostDocU 20% 416 hrs 6/15/04 6/27/05 \$0 \$0 \$0 \$0 0 days

Notes

WBS Description:

Finder Board FPGA Firmware development (OSU). This work includes development of Finder chip firmware. Specifically the development of the portion that contains the finder masks.

M&S BOE: N/A

Labor BOE: Resource: 20% Ohio State Postdoc (B. Kilminster)

1.3.11.2.4 **Preproduction Finder boards (FNAL)** \$138.075 \$48.600 \$89.475

Notes

WBS Description:

Summary task for development of prototype finder boards.

1.3.11.2.4.1 Finder Board Schematic Design \$13,200 \$13,200 0.5 0.5 ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost \$13,200 4 ElecEngF 50% 240 hrs 0 days 6/29/04 9/22/04 \$13,200 \$13,200 \$0

9/23/04

\$0

\$0

\$0

\$0

0

7/21/04

23 Notes

WBS Description:

Shaw

Finder Board Schematic Design: This task will involve the completion of the Finder schematic and the design of the board control logic.

15 days

M&S BOE: N/A

Labor BOE: Resource: 50% FNAL Engineer (T. Shaw) for 12 weeks

50%

180 hrs

1.3.11.2.4.	2	F	inder Board	d layout		\$15,2	95	\$0	\$15,295	0.5	0.5	
	ID	Resource Name Units Work			Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	l
	4	ElecEngF	10%	76 hrs	0 days	7/21/04	12/3/04	\$4,180	\$2,640	\$4,180	\$0	l

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
"Finder Board lavout" continu	ued						

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
5	ElecTechF	38%	285 hrs	0 days	7/21/04	12/3/04	\$11,115	\$7,020	\$11,115	\$0
23	Shaw	10%	66.4 hrs	12 days	8/6/04	12/3/04	\$0	\$0	\$0	\$0
25	Wesson	38%	252.32 hrs	12 days	8/6/04	12/3/04	\$0	\$0	\$0	\$0

Notes

WBS Description:

Finder Board layout: This task will involve the design engineer working closely with a PCB layout professional.

M&S BOE: N/A

Labor BOE: 75% FNAL Sr. Tech (T. Wesson) for 6 weeks

20% FNAL Engineer (T. Shaw) for 6 weeks

1.3.11.2.4.3 L3 Fabrication of Preproduction XFT Finder board \$0 \$0 \$0 0 0 3

Notes

WBS Description:

This milestone denotes the fabrication of the first prototype Finder 1/3 board.

1.3.11.2.4.	4	Purchase Prepro	duction Find	er Board cor	mponents	\$4	8,600	\$48,600	\$0	0	0	0
	ID	Resource Name Units		Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	9	MANDS	48.600	48.600	0 davs	8/11/04	11/17/04	\$48,600	\$48,600	\$48,600	\$0	

Notes

WBS Description:

Purchase Preproduction Finder Board Components: This task will cover the costs of procuring the PCBs and components for four Preproduction Finder modules.

M&S BOE: \$48,600 (4 prototypes @\$12,150) This translates to \$46,215 in FY02 dollars.

Component Cost per module:

PCB @ \$1500

6 dual O/E parts @ \$150 = \$900

2 dual E/O parts @ \$150 = \$300

9 Finder FPGAs @ \$800 = \$7,200 (Altera EP1S25 is ~\$865)

1 FPGA general board Control = \$250

Misc. logic and FRAM = \$500

5 Mezzanine modules @\$300 = \$1,500 (possibly put SERDES parts on mezzanine boards)

Board Total = \$12,150

Labor BOE: N/A

3.11.2.4.5	n	ronoro hid .				Cost	M&S	\$2.420	0	Labor	Leve
		repare bid			•	2,420	\$0	\$2,420	0	0	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
4	ElecEngF	25%	44 hrs	0 days	10/28/04	11/30/04	\$2, <i>4</i> 20	\$3,300	<i>\$2,420</i>	\$0	
23	Shaw	25%	44 hrs	0 days	10/28/04	11/30/04	<i>\$0</i>	\$0	<i>\$0</i>	<i>\$0</i>	
Note	.	25/0	44 1113	0 days	10/26/04	11/30/04	φυ	φυ	φυ	φυ	
WBS I	Description:										

1.3.11.2.4.6

Fabricate Preproduction Finder board

0

Notes

WBS Description:

Period of time allocated for manufacturing the boards.

Labor BOE: 25% FNAL Engineer (T. Shaw) for 4 weeks

M&S BOE: N/A Labor BOE: N/A

1.3.11.2.4.7

Assembly Preproduction Finder Board

0.3

Notes

WBS Description:

Period of time allocated for module assembly.

M&S BOE: N/A Labor BOE: N/A

1.3.11.2.4.8

Test Stand Setup

0.5

0

.0			i coi Otaria	Octup		4	,,,,,,,	ΨΟ	Ψ1,710	0.0	0.5
ID)	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
	5	ElecTechF	10%	44 hrs	0 days	10/21/04	1/13/05	\$1,716	\$1,716	\$608	\$1,108
2	26	Scott	10%	44 hrs	0 days	10/21/04	1/13/05	\$0	\$0	\$0	\$0

Notes

WBS Description:

This task involves the physical set-up of the test stand.

M&S BOE: N/A

Labor BOE: 25% FNAL Sr. Tech (L. Scott) for 4 weeks

WBS		Name				Cost	M&S	FNAL Labor	M&S Cont	. Labor	Level	
1.3.11.2.4.9		Т	est stand s	oftware		\$	55,264	\$0	\$5,264	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	3	CompProfF	20%	112 hrs	0 days	9/24/04	1/7/05	\$5,264	\$5,264	\$959	\$4,305	
	21	Klein	20%	408 hrs	0 days	9/24/04	9/29/05	\$0	\$0	\$0	\$0	

Notes

WBS Description:

Software to test basic functionality of the board. Needs to be ready for the beginning of preproduction testing.

Also, software needed for checkout of production boards.

M&S BOE: N/A

Labor BOE: Rod Klein tasked as the Comp Pro F (20%) 50% time for Jan & Feb 05, 20% time for emaining 7 months.

1.3.11.2.4.1	1.3.11.2.4.10 Finder Board Prepi			duction Testir	ng	\$4	7,040	\$0	\$47,040	0.5	0.5	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	3	CompProfF	50%	240 hrs	0 days	1/31/05	4/22/05	\$11,280	\$11,280	\$0	\$11,280	
	4	ElecEngF	100%	480 hrs	0 days	1/31/05	4/22/05	\$26,400	\$26,400	\$0	\$26,400	
	5	ElecTechF	50%	240 hrs	0 days	1/31/05	4/22/05	\$9,360	\$9,360	\$0	\$9,360	
	7	PostDocU	50%	240 hrs	0 days	1/31/05	4/22/05	<i>\$0</i>	\$0	\$0	\$0	
	21	Klein	50%	240 hrs	0 days	1/31/05	4/22/05	<i>\$0</i>	\$0	\$0	<i>\$0</i>	
	23	Shaw	50%	240 hrs	0 days	1/31/05	4/22/05	<i>\$0</i>	\$0	\$0	\$0	
	24	Holm	50%	240 hrs	0 days	1/31/05	4/22/05	<i>\$0</i>	\$0	\$0	\$0	
	26	Scott	50%	240 hrs	0 days	1/31/05	4/22/05	\$0	\$0	\$0	\$0	

Notes

WBS Description:

Finder Board Preproduction Testing: This task involves the testing of the Preproduction module.

M&S BOE: N/A

Labor BOE:

50% FNAL Engineer (T. Shaw)

50% FNAL Engineer (S. Holm)

50% FNAL Sr. Tech (L. Scott)

50% FNAL Programmer (R. Klein)

50% Purdue Postdoc

WBS			Name)			Cost	M8	S FNAL L	abor M&S	Cont.	Labor	Level
1.3.11.2.4.	.11	Joint Fin	der - Trans	ition Board	test		\$0	\$(\$0		0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Co	ost	
	7	PostDocU	40%	64 hrs	0 days	2/28/05	3/25/05	\$0	\$0	\$0		\$0	
	8	StudentU	40%	64 hrs	0 days	2/28/05	3/25/05	\$0	\$0	\$0		<i>\$0</i>	
	Notes WBS D	s escription:											
	Transiti	on board test.											
	M&S BO	DE: N/A											
	Labor B Res	SOE: sources: FNAL resources 40% Illinois Po 40% Illinois Stu	stdoc (G. Ver		in the resourc	es for 1.3.11.2	2.3.10.						
1.3.11.2.4.	.12	Finder Boa	rd Preprodu	ction Modif	ication		\$4,540	\$() \$4,54	ŀO	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. C		
	4	ElecEngF	50%	40 hrs	0 days	4/25/05	5/6/05	\$2,200	\$2,200	\$(2,200	
	5 23	ElecTechF Shaw	75% 50%	60 hrs 40 hrs	0 days 0 days	4/25/05 4/25/05	5/6/05 5/6/05	\$2,340 \$0	\$2,340 \$0	\$0 \$0		2,340 \$0	
	25	Wesson	75%	60 hrs	0 days 0 days	4/25/05	5/6/05	\$0 \$0	\$0	\$6		\$0 \$0	
		S escription: sk involves board schema	atic and layou	ut modification	ns.								
	M&S BO	DE: N/A											
		SOE: IAL Sr. Tech (T. Wesson IAL Engineer (T. Shaw))										
1.3.11.2.4.	.13	Production Re	adiness Re	view - Finde	er Boards		\$0	\$(\$0		0	0	0
	Notes												
	WBS D	escription:											
	Product	tion Readiness Review F	inder boards										
	M&S BO	DE: N/A											
	Labor B	SOE: N/A											
1.3.11.2.4.	.14	L3 Preprod	luction Find	er Testing E	Begins		\$ 0	\$0	\$0		0	0	3

WBS					Cost	M&S	FNAL Lab	or M&S Co	nt. Labor	Level		
"L3 Preprodu	ction Fi	inder Testing Begins"	continued									
1.3.11.2.5			uction Find	der Boards		\$	6470,924	\$440,00	00 \$30,924	0	0	0
Ī	Notes NBS De	escription:										
F	Production	on Finder Boards: Fabri	cation, stuffir	g and testing	of full set of I	Finder 1/3, Fin	der 2/4, Finder	SL7 boards,	including spares.			
1.3.11.2.5.1		Begin Pro	duction XF	T Finder Bo	ards		\$0	\$0	\$0	0	0	2
ī	Notes	scription:										
		estone marks the begin	ning of produ	ction for the I	Finder SL7 bo	ards after a sı	ıcessful produc	tion readines	s review.			
1.3.11.2.5.2	<u> </u>	P	repare bid p	oackage			\$7,520	\$0	\$7,520	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
				0 days	3/29/05	5/23/05	\$4,400	\$4,400	\$0	\$4,400		
	5	ElecTechF	25%	80 hrs	0 days	3/29/05	5/23/05	\$3,120	\$3,120	\$0	\$3,120	
	23	Shaw	25%	80 hrs	0 days	3/29/05	5/23/05	<i>\$0</i>	\$0	\$0	\$0	
	26	Scott	25%	80 hrs	0 days	3/29/05	5/23/05	\$0	\$0	\$0	\$0	
	Notes											

WBS Description:

Prepare bid package: This tasks refers to work which is done to describe and specify the manufacture of the PCB and the board assembly:

M&S BOE: N/A

Labor BOE:

25% FNAL Engineer (T. Shaw)

25% FNAL Sr. Tech (L. Scott)

1.3.11.2.5.		Puchase Produ	uction Finder E	Board compor	nents	\$440,	000	\$440,000	\$0	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	9	MANDS	440,000	440,000	0 days	3/15/05	6/7/05	\$440,000	\$440,000	\$0	\$440,000	

Notes

WBS Description:

Purchase Production Finder Board components.

M&S BOE: Total: \$440,000 This translates to \$418,410 in FY02 dollars.

Assume 9 Finders/module ->

SL7: 12 modules SL5: 12 modules SL3: 12 modules

WBS			Name)			Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
"Puchase Pr	oduction	n Finder Board compo	nents" con	tinued								
. donado i i	Notes	. i maon Board compo		aoa								
	710100	36 modules	+20% spare	s = 44 module:	s @ ~\$10K							
	Labor B0	DE: N/A										
1.3.11.2.5.	4	Fabricate	Productio	n Finder Boa	ırd		\$0	\$0	\$0	0.3	0	0
	Notes											
	WBS De	scription:										
	Fabricate	e Production Finder Boar	rd compone	nts.								
	M&S BO	E: Total: \$440,000 Th i	is translate:	s to \$418,410	in FY02 dolla	rs.						
		Assume 9 Fi		le ->								
		SL7: 12 mod SL5: 12 mod										
		SL3: 12 mod	dules									
		36 modules	+20% spare	s = 44 module	s @ ~\$10K							
	Labor BO	DE: N/A										
1.3.11.2.5.	5	Assemble	e Productio	n Finder Boa	ard		\$0	\$0	\$0	0	0	0
	Notes											
	WBS De	scription:										
	Assembl	e Production Finder Boa	ırd compone	nts.								
	M&S BO	E: Total: \$440,000 Th	is translate:	s to \$418,410	in FY02 dolla	rs.						
		Assume 9 Fi SL7: 12 mod	dules	le ->								
		SL5: 12 mod SL3: 12 mod										
				s = 44 module	s @ ~\$10K							
	Labor B0	DE: N/A										
1.3.11.2.5.	6	Checkout	Production	n Finder Boai	rds	\$	21,900	\$0	\$21,900	0	0.5	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	3	CompProfF	25%	100 hrs	0 days	7/14/05	9/22/05	\$4,700	\$4,700	\$0	\$4,700	
	4	ElecEngF	25%	100 hrs	0 days	7/14/05	9/22/05	\$5,500	\$5,500	\$0	\$5,500	
	5	ElecTechF	75%	300 hrs	0 days	7/14/05	9/22/05	\$11,700	\$11,700	\$0	\$11,700	
	21 24	Klein Holm	25% 25%	100 hrs	0 days	7/14/05 7/14/05	9/22/05 9/22/05	\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	
	26	Scott	75%	100 hrs 300 hrs	0 days 0 days	7/14/05 7/14/05	9/22/05	\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	
		1 23011	, 0,0	000 1110	o dayo	.,.,,	<i>5,22,00</i>	ΨΟ	ΨΟ	ΨΟ	Ψυ	

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level

"Checkout Production Finder Boards" continued

Notes

WBS Description:

This task covers the effort required to checkout the Finder modules.

M&S BOE: N/A

Labor BOE:

25% FNAL Engineer (S. Holm) 75% FNAL Sr. Tech (L. Scott) 25% FNAL Programmer (R. Klein)

1.3.11.2.5.7	L3 Finder Board Checkout Complete	\$0	\$0	\$0	0	0	3
1.3.11.2.5.8	L3 Production Finder Checkout Begins	\$0	\$0	\$0	0	0	3
1.3.11.2.5.9	L3 Begin Production XFT Finder Boards	\$0	\$0	\$0	0	0	3
1.3.11.2.5.10	Finder Board Checkout Complete	\$0	\$0	\$0	0	0	2
1.3.11.2.5.11	Final revision of test stand software	\$1,504	\$0	\$1,504	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
3	CompProfF	10%	32 hrs	0 days	4/25/05	6/20/05	\$1,504	\$1,504	\$0	\$1,504
21	Klein	10%	32 hrs	0 days	4/25/05	6/20/05	\$0	\$0	\$0	\$0

Notes

Final revison of software used to test Finderboards

Labor BOE: 10% Comp. Prof. FNAL - Rod Klein

1.3.11.3 Test equipment \$23,773 \$23,773

					•	•		•		
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	23,773	23,773	0 days	1/14/05	2/25/05	\$23,773	\$23,773	\$0	\$23,773

\$0

0.3

0

0

Notes

WBS Description:

purchase test equipment for production testing of boards

M&S BOE: This cost is \$23,773 in FY02 dollars.

DVM's, oscilloscope, probes.

Labor BOE:

WBS Name Cost M&S **FNAL Labor** M&S Cont. Labor Level "Test equipment" continued Notes 1.3.11.4 **TDC Transition Module** \$170,000 \$170,000 \$0 0 Notes WBS Description:

TDC Transition Module: The design for these boards already exists and is being used in the Run 2A design. Additional boards are required for the Stereo Segment Finding. We need 54 boards + 6 spares.

0

0

1.3.11.4.1

.1		TDC Tran	sition Mod	ule specificati	on		\$0	\$0	\$0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
	6	PhysicistU	25%	100 hrs	0 days	6/1/04	8/10/04	\$0	\$0	\$0	\$0
	17	ENG UNIV	20%	80 hrs	0 days	6/1/04	8/10/04	\$0	\$0	\$0	\$0
	27	Kasten	20%	81.6 hrs	0 days	6/1/04	8/11/04	\$0	\$0	\$0	\$0

Notes

WBS Description:

This task involves the full specification of the TDC TM functionality and interfaces.

M&S BOE: N/A

Labor BOE:

25% ILL Physicist (Pitts) 25% ILL Engineer (Kasten)

1.3.11.4.2

TDC Transition Module Firmware development \$0 \$0 \$0 0 0 Resource Name Units Work Finish Cost Baseline Cost Act. Cost ID Delay Start Rem. Cost 17 ENG UNIV 10% 110.4 hrs 8/18/04 3/9/05 \$0 \$0 \$0 \$0 0 days 27 Kasten 10% 111.2 hrs 8/18/04 3/10/05 \$0 \$0 \$0 \$0 0 days

Notes

WBS Description:

TDC Transition Module Firmware development by Illinois personnel.

M&S BOE: N/A

Labor BOE: 15% ILL Engineer (Kasten)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.4.3	Preproduction TDC Fiber Transition Boards	\$10,000	\$10,000	\$0	0	0	0

Notes

WBS Description:

Summary task for development of prototype finder boards.

Summary task for development of prototype inder boards

1.3.11.4.3.1 TDC Fiber Transition Board schematic design \$0 0.5 0.5 Resource Name Units Work Start Finish Cost Baseline Cost Act. Cost Rem. Cost Delay ENG UNIV 17 40% 110.4 hrs 0 days 6/29/04 8/17/04 \$0 \$0 \$0 \$0 27 Kasten 40% 112 hrs 0 days 6/29/04 8/17/04 \$0 \$0 \$0 \$0

Notes

WBS Description:

This task will involve the completion of the TDC TM schematic and the design of the board control logic.

M&S BOE: N/A

Labor BOE: 50% ILL Engineer (Kasten)

1.3.11.4.3.2 TDC Fiber Transition Board layout \$0 \$0 \$0 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	ENG UNIV	40%	96 hrs	0 days	7/21/04	8/31/04	\$0	\$0	\$0	\$0
27	Kasten	40%	96 hrs	0 days	7/21/04	8/31/04	\$0	\$0	\$0	\$0

Notes

WBS Description:

This task will involve the layout implementation of the schematic design.

M&S BOE: N/A

Labor BOE: 50% ILL Engineer (Kasten)

1.3.11.4.3.3 Test Stand Setup (Hardware) \$0 \$0 \$0 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
14	PostDoc	10%	16 hrs	0 days	9/1/04	9/29/04	\$0	\$0	\$0	\$0
17	ENG UNIV	10%	16 hrs	0 days	9/1/04	9/29/04	\$0	\$0	\$0	\$0
27	Kasten	10%	16 hrs	0 days	9/1/04	9/29/04	\$0	\$0	\$0	<i>\$0</i>

Notes

WBS Description:

This task will rely heavily upon the TDC Mezzanine card test stand.

WBS Name Cost M&S **FNAL Labor** M&S Cont. Labor Level

"Test Stand Setup (Hardware)" continued

Notes

M&S BOE:

Labor BOE:

10% ILL Engineer (Kasten) 10% ILL technician (Sibert)

1.3.11.4.3.4

3.4		Purchase T	ransition Boa	ard componer	nts	\$10	,000	\$10,000	\$0	0	0	
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
Γ	7	PostDocU	10%	21.6 hrs	0 days	8/18/04	9/24/04	\$0	\$0	\$0	\$0	
L	10	MANDSPASS	10,000	10,000	0 days	8/18/04	9/24/04	\$10,000	\$10,000	\$10,000	\$0	

Notes

WBS Description:

This task will cover the costs of procuring the PCBs and components for ten Preproduction TDC transition modules. The TDC TM will be implemented as a transition module plus a daughtercard. The cost includes both pieces.

M&S BOE: \$10,000 (10 preproduction boards @\$1,000) This translates to \$9,509 in FY02 dollars.

Component Cost per module:

PCB @ \$250

Formatter FPGA = \$100

Connectors: \$200

20 Optical transceiver + SERDES @ \$120 = \$240

Other parts: \$200 Board Total = \$1000 Assembly: in-house

Labor BOE: 10% ILL Tech (Sibert)

1.3.11.4.3.5

TDC Transition Board fabrication

\$0

\$0

0.5

0.5

0

0

0

Notes

WBS Description:

Period of time for board manufacture

M&S BOE: N/A Labor BOE: N/A

1.3.11.4.3.6

3.6		Assemble Prep	roduction ⁻	TDC Transition	on Board		\$0	\$0	\$0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
Γ	7	PostDocU	50%	180 hrs	0 days	9/27/04	11/30/04	\$0	\$0	\$0	\$0
	8	StudentU	50%	180 hrs	0 days	9/27/04	11/30/04	\$0	\$0	\$0	\$0

WBS Cost Name M&S **FNAL Labor** M&S Cont. Labor Level "Assemble Preproduction TDC Transition Board" continued Notes WBS Description: In-house assembly for preproduction. M&S BOE: N/A Labor BOE: 50% ILL Tech (Sibert) 50% ILL undergrad tech 1.3.11.4.3.7 **TDC Transition Board Testing** 0.5 0.5 Finish Baseline Cost Act. Cost ID Resource Name Units Work Delay Start Cost Rem. Cost 9/30/04 \$0 PostDocU 20% 184 hrs 3/18/05 \$0 \$0 \$0 0 days \$0 3/18/05 \$0 \$0 \$0 8 StudentU 10% 92 hrs 0 days 9/30/04 \$0 13 **Physicist** 60% 552 hrs 0 days 9/30/04 3/18/05 \$0 \$0 \$0 \$0 \$0 \$0 \$0 17 **ENG UNIV** 40% 368 hrs 0 days 9/30/04 3/18/05 \$0 \$0 27 Kasten 40% 368 hrs 0 days 9/30/04 3/18/05 \$0 \$0 Notes WBS Description: This task involves the testing of the Preproduction module. M&S BOE: N/A Labor BOE: 30% ILL Physicist (Pitts) 30% ILL Physicist (Veramendi) 20% ILL Grad Student (Levine) 10% ILL Tech (Sibert) 10% ILL EE (Kasten) 1.3.11.4.3.8 TDC Transition Board B0 Test \$0 \$0 0 0 Notes WBS Description: This task is testing of the transition card in a TDC crate on the detector. Labor BOE included in WBS 1.3.11.4.3.7 1.3.11.4.3.9 TDC Transition Board Preproduction modification \$0 0 Finish Rem. Cost Resource Name Units Work Delay Start Cost Baseline Cost Act. Cost **ENG UNIV** 50% 40 hrs 0 days 3/28/05 4/8/05 \$0 \$0 \$0 \$0

	ID	ard Preproduction moderate Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
	27	Kasten	50%	40 hrs	0 days	3/28/05	4/8/05	\$0	\$0	\$0	\$0
	Notes	3	•		<u> </u>			•		-	
		escription:									
	This tas	k involves board schema	atic and layor	ut modification	ıs.						
		DE: N/A	·								
	Labor B	OE: 50% ILL Engineer	(Kasten)								
11.4.3.1	10	Production Readin	ess Review	- TDC Tran	sition Boards	S	\$0	\$	0 \$0	0	0
.11.4.3.1	11	Prepare MOU, S	OW, Sole S	Source to U	of I and PO		\$0	\$	0 \$0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
	6	PhysicistU	10%	72 hrs	0 days	6/29/04	11/3/04	\$0	\$0	\$0	\$0
	Notes	3									
	WBS D	escription:									
	MOU, S	OW , Sole Source and F	O for U of I t	o build TDC t	ransition modu	ules. XTC card	ds and engine	erina costs	for XFT project at Illin	nis	
								cring ocoto		010	
	M&S BC	DE: N/Δ						cring oodio		010	
		DE: N/A				,	3	omig doors	. ,	010	
		DE: N/A OE: 10% ILL Physicist (Pitts)			,	3	orning occio	• ,	550	
	Labor B			n Board Fab	rication		\$ 0	\$		0) 0
3.11.4.3.1	Labor B 12	OE: 10% ILL Physicist (L3 Begin Fib	er Transitio				-	-	0 \$0		-
3.11.4.3.1 3.11.4.3.1	Labor B 12 13	OE: 10% ILL Physicist (L3 Begin Fibe L3 Begin	er Transitio Preproduct	ion FTB Tes	ting		\$0 \$0	\$	0 \$0 0 \$0	0	0
3.11.4.3.1 3.11.4.3.1	Labor B 12 13	OE: 10% ILL Physicist (L3 Begin Fib L3 Begin Test Sta	er Transitio Preproduct and Softwar	ion FTB Tes e developm	iting ent		\$0 \$0 \$0	\$ \$ \$	0 \$0 0 \$0 0 \$0	0 0 0	0 0
	Labor B 12 13	OE: 10% ILL Physicist (L3 Begin Fiber L3 Begin Test Sta	er Transitio Preproduct	ion FTB Tes e developme Work 160 hrs	ting	Start 9/1/04	\$0 \$0 \$0 Finish 12/28/04	\$ \$ Cost	0 \$0 0 \$0 0 \$0 0 \$0 Baseline Cost \$0	0 0 0 Act. Cost	0 0 0 Rem. Cost \$0
3.11.4.3.1 3.11.4.3.1	Labor B 12 13 14 ID 8 17	OE: 10% ILL Physicist (L3 Begin Fiber L3 Begin Test State Resource Name StudentU ENG UNIV	er Transitio Preproduct and Softwar Units 25% 25%	ion FTB Tes e developme Work 160 hrs 270 hrs	ent Delay 0 days 0 days	Start 9/1/04 9/1/04	\$0 \$0 \$0 Finish 12/28/04 3/18/05	\$ \$ Cost \$0 \$0	0 \$0 0 \$0 0 \$0 0 \$0 Baseline Cost \$0 \$0	0 0 0 Act. Cost \$0 \$0	0 0 0 0 Rem. Cost \$0 \$0
.11.4.3.1 .11.4.3.1	Labor B 12 13 14 ID 8	OE: 10% ILL Physicist (L3 Begin Fiber L3 Begin Test Sta	er Transitio Preproduct and Softwar Units 25%	ion FTB Tes e developme Work 160 hrs	ent Delay 0 days	Start 9/1/04	\$0 \$0 \$0 Finish 12/28/04	\$ \$ Cost \$0 \$0	0 \$0 0 \$0 0 \$0 0 \$0 Baseline Cost \$0 \$0	0 0 0 Act. Cost \$0 \$0	0 0 0 0 Rem. Cost \$0 \$0
11.4.3.1 11.4.3.1 11.4.3.1	Labor B 12 13 14 ID 8 17 27 Notes	OE: 10% ILL Physicist (L3 Begin Fiber L3 Begin Test State Resource Name StudentU ENG UNIV Kasten	er Transitio Preproduct and Softwar Units 25% 25% 25%	ion FTB Tes e developme Work 160 hrs 270 hrs	ent Delay 0 days 0 days	Start 9/1/04 9/1/04	\$0 \$0 \$0 Finish 12/28/04 3/18/05	\$ \$ Cost \$0 \$0	0 \$0 0 \$0 0 \$0 0 \$0 Baseline Cost \$0 \$0	0 0 0 Act. Cost \$0 \$0	0 0 0 0 Rem. Cost \$0 \$0

WBS Description:

Preproduction Finder Boards: develop a small number (3) preproduction boards to test modifications determined during prototype testing.

WBS			Name			Cos	st	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.4.4.	1	L3 Begin Produc	tion TDC Fibe	r Transition E	Boards	\$0)	\$0	\$0	0	0	3
1.3.11.4.4.2	2	Purchase TDC	Transition Bo	oard compone	ents	\$160,	000	\$160,000	\$0	0.5	0.5	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	7	PostDocU	10%	40 hrs	0 days	2/14/05	4/22/05	\$0	\$0	\$0	\$0	
	10	MANDSPASS	160,000	160,000	0 days	2/14/05	4/22/05	\$160,000	\$160,000	\$0	\$160,000	
	17	ENG UNIV	5%	20 hrs	0 days	2/14/05	4/22/05	\$0	\$0	\$0	\$0	
	27	Kasten	5%	20 hrs	0 days	2/14/05	4/22/05	\$0	\$0	\$0	\$0	

Notes

WBS Description:

Purchase TDC TM components

M&S BOE: 126 modules +25% spares = 160 modules @ \$1K for a total of: \$160,000. This translates to \$152,150 in FY02 dollars.

Labor BOE:

5% ILL Engineer (Kasten)

1.3.11.4.4.3 Fabricate TDC Transtion Board \$0 0

Notes

WBS Description:

Period of time for board manufacture.

M&S BOE: N/A Labor BOE: N/A

1.3.11.4.4.4 Assemble TDC Transition Board \$0 \$0 0.3 0

Notes

WBS Description:

Period of time for module assembly.

M&S BOE: N/A Labor BOE: N/A

Checkout of Production TDC Transition Boards \$0 1.3.11.4.4.5 0.5 0.5 0 Resource Name Work Start Finish Cost Baseline Cost Act. Cost Rem. Cost Units Delay 5/24/05 \$0 6 **PhysicistU** 60% 216 hrs 0 days 7/27/05 \$0 \$0 \$0

7 PostDocU 200% 720 hrs 0 days 5/24/05 7/27/05 \$0 \$0 \$0 \$0 StudentU 20% 72 hrs 0 days 5/24/05 7/27/05 \$0 \$0 \$0 \$0

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
"Checkout of Prod	uction TDC Transition Boards" continued						
Note	es						
WBS	Description:						
Task	covers work required to checkout TDC transition modules.						
M&S E	BOE: N/A						
Labor	BOE:						
30% II 100% 100%	LL Physicist (Pitts) LL Physicist (Veramendi) ILL Grad Student (Levine) ILL Grad Student (Chu) LL Tech (Sibert)						
1.3.11.4.4.6	L3 Checkout of TDC Transition Boards Complete	\$0	\$0	\$0	0	0	3
1.3.11.4.4.7	L3 Begin Production TDC Transition Board Checkout	\$0	\$0	\$0	0	0	3
1.3.11.4.4.8	Begin Production TDC Fiber Transition Boards	\$0	\$0	\$0	0	0	2
1.3.11.4.4.9	Checkout of TDC Transition Boards Complete	\$0	\$0	\$0	0	0	2

Notes

1.3.11.5

WBS Description:

TDC Transition Module: The design for these boards already exists and is being used in the Run 2A design. Additional boards are required for the Stereo Segment Finding. We need 54 boards + 6 spares.

\$169,320

\$169,320

\$0 0 0 O

1.3.11.5.1	TDC Mezzanine Card firmware development	\$61,600	\$61,600	\$0	0	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	61,600	61,600	0 days	6/1/04	7/12/05	\$61,600	\$61,600	\$31,016	\$30,584
17	ENG UNIV	50%	536 hrs	0 days	6/1/04	12/8/04	<i>\$0</i>	\$0	\$0	<i>\$0</i>
28	Mokos	50%	908 hrs	53 days	8/13/04	7/12/05	<i>\$0</i>	\$0	\$0	\$0

Notes

WBS Description:

Firmware development

M&S BOE:

0.5*FTE X 40 hrs/wk X \$55/hr x 56 wks = \$61,600 (note ElecEngF - \$55/hr)

TDC Mezzanine Card

Labor BOE: ILL Engineer Mokos (50%) (1120 hrs)

M&S **WBS** Name Cost **FNAL Labor** M&S Cont. Labor Level 1.3.11.5.2 **Preproduction TDC Mezzanine Card** \$22,220 \$0 0 \$22,220 0 0

Notes

WBS Description:

Summary task for development of prototype finder boards.

1.3.11.5.2.1 Test Stand Setup \$4,400 \$4,400 \$0 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	5%	8 hrs	0 days	6/1/04	6/28/04	\$0	\$0	\$0	\$0
12	MANDSPASSL	4,400	4,400	0 days	6/1/04	6/28/04	\$4,400	\$0	\$4,400	\$0
17	ENG UNIV	60%	96 hrs	0 days	6/1/04	6/28/04	<i>\$0</i>	\$0	\$0	\$0
27	Kasten	10%	16 hrs	0 days	6/1/04	6/28/04	<i>\$0</i>	\$0	\$0	\$0
28	Mokos	50%	80 hrs	0 days	6/1/04	6/28/04	\$0	\$0	\$0	\$0

Notes

WBS Description:

This task involves installation and commissioning of a fully functional CDF VME test stand, including power supply, controller, testclock and TRACER.

M&S BOE: N/A

Labor BOE:

10% ILL engineer (Kasten)

50% ILL engineer (Mokos)

5% ILL technician (Sanders)

0.5 *(FTE) X 4 wks X 40 hrs X 55/hr = \$4400

(80 hrs)

(ElecEngF - \$55/hr)

1.3.11.5.2.2	TDC Mezzanine Card testing	\$13,200	\$13,200	\$0	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	760 hrs	0 days	6/29/04	11/10/04	\$0	\$0	\$0	\$0
12	MANDSPASSL	13,200	13,200	0 days	6/29/04	11/10/04	\$13,200	\$13,200	\$13,200	\$0
13	Physicist	25%	190 hrs	0 days	6/29/04	11/10/04	<i>\$0</i>	\$0	\$0	\$0
17	ENG UNIV	50%	380 hrs	0 days	6/29/04	11/10/04	<i>\$0</i>	\$0	\$0	\$0
28	Mokos	50%	332 hrs	12 davs	7/16/04	11/10/04	\$0	\$0	\$0	\$0

Notes

WBS Description:

This task will involve full functionality testing of the TMC board in the Illinois test crate, followed by integration tests at both Illinois and Fermilab.

M&S BOE: Mokos' time

0.5 (FTE) X 40 hrs/wk X 12 wks X \$55/hr = \$13200

(240 hrs)

WBS	WBS Name				С	ost	M&S	FNAL Labor	M&S Cont.	Labor	Level	
"TDC Mezz	zanine C	ard testing" continued										
	Notes	ecEngF - \$55/hr)										
	(Note E	ecenge - \$55/111)										
	Labor Bo	OE:										
	100% IL	L Physicist (Junk) L Grad Student (Budd) L Engineer (Mokos)										
1.3.11.5.2	2.3	TDC Mezzanine	e Card Prep	roduction m	odification	\$4	,620	\$4,620	\$0	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	12	MANDSPASSL	4,620	4,620	0 days	10/21/04	11/18/04	\$4,620	\$4,620	\$4,620	\$0	
	17 28	ENG UNIV Mokos	50% 50%	84 hrs 84 hrs	0 days 0 days	10/21/04 10/21/04	11/18/04 11/18/04	\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	
	Notes	1	l l					·	,	,	·	
		escription:										
	This tasl	k will involve layout modi	ifications base	ed upon prepr	oduction test r	esults.						
		DE: Mokos' time = \$4620 ElecEngF rate \$55/hr))									
	Labor Bo	OE: 50% ILL Engineer (Mokos)									
	\$55/hr X	(84 hrs (=0.5 (FTE) X 4	1.2 wks X 40h	rs/wk) = \$462	20							
1.3.11.5.2	2.4	Production Readin	ess Review	- TDC Mez	zanine Card		\$0	\$0	\$0	0	0	0
1.3.11.5.	.3	Producti	on TDC Me	ezzanine Ca	ard	\$8	5,500	\$85,500	\$0	0	0	0
	Notes											
		escription:										
	Preprod	uction Finder Boards: de	velop a small	number (3) p	reproduction b	oards to test m	odifications det	ermined durin	g prototype testing.			
1.3.11.5.3	3.1	L3 Begin Pro	duction TD0	C Mezzanin	e Card		\$0	\$0	\$0	0	0	3
1.3.11.5.3	3.2	Purchase TD0	C Mezzanin	e Card com	ponents	\$80	0,000	\$80,000	\$0	0.5	0.5	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	

10 Notes

WBS Description:

MANDSPASS

This task will cover the costs of procuring the PCBs and components for the Production TMC boards.

80,000

0 days

80,000

1/19/05

\$80,000

\$80,000

\$66,400

\$13,600

10/28/04

WBS	N	ame	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
"Purchase TD	C Mezzanine Card components" c	ontinued						
	Notes							
M	1&S BOE: 126 boards + 25% spares =	160 boards @ \$500 = \$80,000.	Cost estimate based upon pr	ototype board ar	nd includes assembly.	This translates	to \$76,075 in F	Y02 dollars.
La	abor BOE: N/A							
1.3.11.5.3.3	Fabricate TDC	Mezzanine Card	\$0	\$0	\$0	0	0	0
	Notes							
W	/BS Description:							
P	eriod of time for board manufacture.							
1.3.11.5.3.4	Assemble TDC	Mezzanine Card	\$0	\$0	\$0	0.3	0	0

Notes

WBS Description:

Period of time for module assembly.

M&S BOE: N/A Labor BOE: N/A

1.3.11.5.3.	5	Checkout of P	roduction T	DC Mezzanir	· · · · · · · · · · · · · · · · · · ·			\$5,500	\$0	0.5	0.5	
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	6	PhysicistU	25%	100 hrs	0 days	2/9/05	4/20/05	\$0	\$0	\$0	\$0	
	7	PostDocU	10%	40 hrs	0 days	2/9/05	4/20/05	\$0	\$0	\$0	\$0	
	12	MANDSPASSL	5,500	5,500	0 days	2/9/05	4/20/05	\$5,500	\$5,500	\$0	\$5,500	
	17	ENG UNIV	25%	100 hrs	0 days	2/9/05	4/20/05	<i>\$0</i>	<i>\$0</i>	\$0	\$0	
	28	Mokos	25%	100 hrs	0 days	2/9/05	4/20/05	<i>\$0</i>	\$0	\$0	\$0	

Notes

WBS Description:

This task involves testing of the production boards in the Illinois test stand.

M&S BOE:

UIUC Electrical Engineer (Mokos)

\$55/hr X 100 hrs (= 0.25 (FTE) X 10 wks X 40 hrs/wk) = \$5500

(Note - ElecEngF rate \$55/hr)

Labor BOE:

25% ILL Physicist (Junk)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
Notes 100% o 100% o 25% II	ction TDC Mezzanine Card" continued S f ILL Grad Student (Budd) f ILL Grad Student (Rogers) L Engineer (Mokos) L Technician (Sibert)						
1.3.11.5.3.6	L3 Checkout of TDC Mezzanine Cards Complete	\$0	\$0	\$0	0	0	3
1.3.11.5.3.7	L3 Begin Checkout of TDC Mezzanine Card	\$0	\$0	\$0	0	0	3
1.3.11.5.3.8	Begin Production TDC Mezzanine Card	\$0	\$0	\$0	0	0	2
1.3.11.5.3.9	Checkout of TDC Mezzanine Cards Complete	\$0	\$0	\$0	0	0	2
1.3.11.6	Cables	\$57,720	\$51,480	\$6,240	0	0	0

WBS Description:

1.3.11.6.1					\$4,000 \$4,000			0.3	0.5	0		
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	9	MANDS	4,000	4,000	0 days	1/10/05	3/21/05	\$4,000	\$4,000	\$0	\$4,000	
	13	Physicist	10%	40 hrs	0 days	1/10/05	3/21/05	<i>\$0</i>	\$0	<i>\$0</i>	\$0	

Notes

WBS Description:

Finder3D to Stereo Association Module cable fabrication + installation -

M&S BOE:

cost \$8000 + contingency Cost of Run 2A Linker to XTRP Cables. Estimated cost of \$4,000 for Run IIb Project. This translates to \$3,804 in FY02 dollars.

Labor BOE:

Finder to SLAM \$12,480 \$12,480 \$0 0 0 1.3.11.6.2 Rem. Cost Work Start Finish Cost Baseline Cost Act. Cost Resource Name Units Delay 3/21/05 \$12,480 \$12,480 \$12,480 MANDS 12,480 9 12,480 0 days 1/10/05 \$0

Notes

WBS Description:

Stereo finder to SLAM board fiber connections.

WBS			Name				Cost	M&S	FNAL La	bor M&S C	Cont. Labo	r Level
"Finder to S	LAM" co Notes M&S Bo	S										
	Assume	e 216 fibers + 10% spare	s = 240 fibers									
	Newark	online catalog price for	3m fiber with L	_C connectors	\$52 each							
	Cost =	\$12,480										
	Labor E	BOE:										
1.3.11.6.			TDC to Fir			\$4	41,240	\$35,000	-		0	0
1.3.11.6.3	.1 	Resource Name	tion of TDC t	Work	Delay Delay	Start	\$0 Finish	\$0 Cost	\$0 Baseline Cost	Act. Cost	0 Rem. Cost	0
	7	PostDocU	25%	250 hrs	0 days	7/15/04	1/14/05	\$0	\$0	\$0	\$0	
1.3.11.6.3	_		er TDC to Fin				35,000	\$35,000		0	0	0
	ID	Resource Name	Units 10%	Work	Delay	Start 1/18/05	Finish 3/28/05	Cost \$	Baseline Cos	st Act. Co \$0		\$0
	7 9	PostDocU MANDS	35,000	40 hrs 35,000	0 days 0 days	1/18/05	3/28/05	\$35,00			\$0 \$0 \$35,	
1.3.11.6.3		OE: Cost includes 325 n	nulti-mode opt		n terminations		nel. Waiting fo	or additional d	etaisl from Kevin Pi \$6,240		0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost		
	5	ElecTechF	100%	160 hrs	0 days	3/29/05	4/25/05	\$6,240	\$6,24	0 \$	\$6,24	10
1.3.11.6.3	.4	L3 Receipt of	TDC to Find	ler cables Co	omplete		\$0	\$0	\$0	0	0	3
1.3.11.6.3	.5	L3 Specification	of TDC to F	inder cables	Complete		\$0	\$0	\$0	0	0	3
1.3.11.6.3	.6	Receipt of T	DC to Finde	r cables Cor	nplete		\$0	\$0	\$0	0	0	2
1.3.11.7		Stereo Linke	r Associatio	on Module (SLAM)	\$1	82,020	\$182,02	0 \$0	0	0	0
		s escription: Output Module II capture	s the track list	from Linker M	lodules and d	rives the data t	to the XTRP a	nd the Stereo	Association Modul	e. We need 24	boards + 6 spares	
1.3.11.7.	1	SLA	AM Board sp	ecification			\$0	\$0	\$0	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish		Baseline Cost	Act. Cost	Rem. Cost	
	6	PhysicistU	50%	240 hrs	0 days	6/1/04	8/24/04	\$0	\$0	\$0	\$0	

WBS Name Cost M&S **FNAL Labor** M&S Cont. Labor Level

"SLAM Board specification" continued

Notes

WBS Description:

SLAM Board specification: This task will include design specification and draft report on the SLAM board implementation.

M&S BOE: N/A

Labor BOE:

25% OSU Physicist (Hughes) 25% OSU Physicist (Winer)

1.3.11.7.2

SLAM Board FPGA Firmware development

\$0

0

Baseline Cost Act. Cost ID Resource Name Units Work Delay Start Finish Cost Rem. Cost 7/14/04 30% 624 hrs 0 days 7/26/05 \$0 \$0 \$0 \$0 6 **PhysicistU** \$0 \$0 \$0 7 PostDocU 20% 416 hrs 0 days 7/14/04 7/26/05 \$0

Notes

WBS Description:

SLAM Board FPGA Firmware development: This work will include development of SLAM chip firmware, VMEbus slave interface and various control algorithms.

M&S BOE: N/A

Labor BOE:

20% OSU Physicist (Lannon)

20% OSU Grad Student (Parks)

10% OSU Physicist (Hughes)

1.3.11.7.3	1	.3.	11	1.7	.3
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.3		Linker Board	FPGA Firmw	are modifica	tions	\$20	,280	\$20,280	\$0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
Γ	6	PhysicistU	10%	208 hrs	0 days	7/28/04	8/9/05	\$0	\$0	\$0	\$0
	12	MÄNDSPASSL	20,280	20,280	0 days	7/28/04	8/9/05	\$20,280	\$20,280	\$8,502	\$11,778
	31	OSU Tech	25%	520 hrs	0 days	7/28/04	8/9/05	\$0	\$0	\$0	\$0

Notes

WBS Description:

Linker Board FPGA Firmware modifications: This work will include modifications of Linker firmware, and Output Formatter firmware.

M&S BOE: \$39/hr X 2080 hrs X 25% = \$20,280 (Assume FNAL Elec Tech rate of \$39/hr)

Labor BOE:

10% OSU Physicist (Winer)

25% OSU Tech (xxxx) (Assume FNAL Elec Tech rate of \$39/hr)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.7.4	Preproduction SLAM Boards	\$33,940	\$33,940	\$0	0	0	0
1.3.11.7.4.1	SLAM Board schematic design	\$0	\$0	\$0	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	25%	80 hrs	0 days	6/29/04	8/24/04	\$0	\$0	\$0	\$0
17	ENG UNIV	50%	160 hrs	0 days	6/29/04	8/24/04	\$0	\$0	<i>\$0</i>	\$0
29	Johnson	50%	160 hrs	0 days	6/29/04	8/24/04	\$0	\$0	\$0	\$0

Notes

WBS Description:

SLAM Board schematic design: This task will involve the completion of the SLAM schematic and the design of the board control logic.

M&S BOE: N/A

Labor BOE:

25% OSU Physicist (Winer) 50% OSU Engineer (Johnson)

1.3.11.7.4.2		SLAM Bo	oard Prepro	duction layor	ut	\$4	4,680	\$4,680	\$0	0.3	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
	12	MANDSPASSL	4,680	4,680	0 days	7/21/04	10/27/04	\$4,680	\$4,680	\$4,680	\$0
	17	ENG UNIV	50%	280 hrs	0 days	7/21/04	10/27/04	<i>\$0</i>	\$0	\$0	\$0
	29	Johnson	50%	280 hrs	0 days	7/21/04	10/27/04	<i>\$0</i>	\$0	\$0	\$0

7/21/04

10/27/04

\$0

\$0

\$0

0

\$0

31 Notes

WBS Description:

SLAM Board Preproduction layout: This task will involve the design engineer working closely with a PCB layout professional.

0 days

280 hrs

M&S BOE: \$39/hr X 240 hrs X 50% = \$4,680

Labor BOE:

50% OSU Tech (?) (Assume FNAL Elec Tech rate of \$39/hr)

50%

50% OSU Engineer (Johnson)

OSU Tech

WBS Name					С	ost	M&S	FNAL Labor	M&S Cont.	Labor	Level	
1.3.11.7.4.3	1.3.11.7.4.3 Purchase SLAM Board Preproduction components				nponents	\$1 ⁻	7,560	\$17,560	\$0	0	0.5	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	10	MANDSPASS	16,000	16,000	0 days	8/25/04	12/28/04	\$16,000	\$16,000	\$16,000	\$0	1
	12	MANDSPASSL	1,560	1,560	0 days	8/25/04	12/28/04	\$1,560	\$1,560	\$1,560	\$0	
	31	OSU Tech	10%	68 hrs	0 days	8/25/04	12/28/04	\$0	\$0	\$0	\$0	

Notes

WBS Description:

Purchase SLAM Board Preproduction components: This task will cover the costs of procuring the PCBs and components for four Preproduction Finder modules.

M&S BOE: \$16,000 (4 prototypes @\$4,000) This translates to \$15,215 in FY02 dollars.

Component Cost per module: PCB @ \$1500

1 SLAM FPGA=\$600

1 FPGA VME interface\control = \$250

9 Optical transceiver + SERDES @ \$120 = \$1080

Other parts: \$600 Board Total = \$4000

Labor BOE: 10% OSU Tech (?) \$39/hr X 400 hrs X 10% = \$1,560 (Assume FNAL Elec Tech rate of \$39/hr)

1.3.11.7.4.4	Fabricate Preproduction SLAM Board	\$0	\$0	\$0	0	0	0
Notes							
WBS Definiti	on:						
Fabricate Pr	eproduction SLAM Board: Period of time for board manufacture.						
M&S BOE: I	N/A						
Labor BOE:	N/A						
1.3.11.7.4.5	Assemble Preproduction SLAM Board	\$0	\$0	\$0	0.3	0	0
Notes WBS Descri	otion:						

Assemble Preproduction SLAM Board: Period of time for module assembly

M&S BOE: N/A Labor BOE: N/A

WBS Name					С	ost	M&S	FNAL Labor	M&S Cont	t. Labor	Level	
1.3.11.7.4.6	6	SLAM	Board Test	Stand setup		\$2	,340	\$2,340	\$0	0	0.5	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	12	MANDSPASSL	2,340	2,340	0 days	10/21/04	1/6/05	\$2,340	\$2,340	\$2,225	\$115	
	13	Physicist	25%	100 hrs	0 days	10/21/04	1/6/05	\$0	\$0	\$0	<i>\$0</i>	
	31	OSU Tech	25%	100 hrs	0 days	10/21/04	1/6/05	\$0	\$0	<i>\$0</i>	\$0	

Notes

WBS Description:

SLAM Board Test Stand setup: This task involves the physical setup of the test stand.

M&S BOE: \$39/hr X 240 hrs X 25% = \$2,340 (Assume FNAL Elec Tech rate of \$39/hr)

Labor BOE:

25% OSU Physicist (Hughes)

25% OSU Tech (?)

1.3.11.7.4.	7	SLAM Bo	ard Prepro	duction testir	ng	\$	7,800	\$7,800	\$0	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	6	PhysicistU	60%	240 hrs	0 days	1/24/05	4/1/05	\$0	\$0	\$0	\$0	
	7	PostDocU	20%	80 hrs	0 days	1/24/05	4/1/05	\$0	\$0	\$0	\$0	
	12	MANDSPASSL	7,800	7,800	0 days	1/24/05	4/1/05	\$7,800	\$7,800	\$0	\$7,800	
	31	OSU Tech	50%	200 hrs	0 days	1/24/05	4/1/05	\$0	\$0	\$0	\$0	

Notes

WBS Description:

SLAM Board Preproduction testing: This task involves the testing of the Preproduction module.

M&S BOE: \$39/hr X 400 hrs X 50% = \$7,800 (Assume FNAL Elec Tech rate of \$39/hr)

Labor BOE:

30% OSU Physicist (Hughes)

30% OSU Physicist (Winer)

20% OSU Grad Student (Parks)

50% OSU Tech (?)

1.3.11.7.4.8 Joint SLAM - Finder Test \$0 \$0 ΙD Resource Name Units Work Finish Cost Baseline Cost Act. Cost Delay Start Rem. Cost 60% \$0 \$0 \$0 6 **PhysicistU** 96 hrs 0 days 2/21/05 3/18/05 \$0

Notes

WBS Description:

Joint SLAM - Finder Test

WBS Name Cost M&S FNAL Labor M&S Cont. Labor Level "Joint SLAM - Finder Test" continued Notes M&S BOE: N/A Labor BOE: 30% OSU Physicist (Lannon) 30% OSU Physicist (Kilminster) 1.3.11.7.4.9 **SLAM Board Preproduction modification** \$1,560 \$1,560 \$0 0 0 0 ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost MANDSPASSL 12 1.560 1.560 0 days 3/21/05 4/1/05 \$1.560 \$1.560 \$0 \$1.560 **ENG UNIV** 3/21/05 \$0 \$0 17 50% 40 hrs 0 days 4/1/05 \$0 \$0 29 Johnson 50% 40 hrs 0 days 3/21/05 4/1/05 \$0 \$0 \$0 \$0 \$0 \$0 \$0 31 3/21/05 \$0 OSU Tech 50% 40 hrs 0 days 4/1/05 Notes WBS Description: SLAM Board Preproduction modification: This task involves board schematic and layout modifications. M&S BOE: \$39/hr X 80 hrs X 50% = \$1,560 (Assume FNAL Elec Tech rate of \$39/hr) Labor BOE: 50% OSU Tech (?) 50% OSU Engineer (Johnson) 1.3.11.7.4.10 Production Readiness Review - SLAM Board \$0 Notes WBS Description: Production readiness Review for SLAM Board M&S BOE: N/A Labor BOE: N/A 1.3.11.7.4.11 Prepare MOU, SOW, Sole Source to OSU \$0 \$0 \$0 0 0 0 Resource Name ID Start Finish Cost Baseline Cost Act. Cost Rem. Cost Units Work Delav \$0 \$0 6 **PhysicistU** 10% 44 hrs 0 days 8/25/04 11/10/04 \$0 \$0 Notes WBS Description:

Prepare MOU, SOW, Sole Source to OSU: This tasks refers to work which is done to describe and specify the manufacture of the PCB and the board assembly.

WBS		Name			Cos	st	M&S	FNAL Labor	M&S Cont.	Labor	Level
"Prepare MOU, SO <i>Note</i>	W, Sole Source to OSUs	J" continued									
M&S B	OE: N/A										
Labor E	BOE:										
	U Physicist (Hughes) U Physicist (Winer)										
1.3.11.7.4.12	L3 Begin Fabri	cation of Prep	rod SLAM Bo	oard	\$0		\$0	\$0	0	0	3
1.3.11.7.4.13	L3 Begin P	reprod SLAM I	Board Testing	9	\$0		\$0	\$0	0	0	3
1.3.11.7.5	Prod	uction SLAM	Boards		\$127,	800	\$127,800	\$0	0	0	0
1.3.11.7.5.1	L3 Begin F	Production of S	LAM Boards		\$0		\$0	\$0	0	0	3
1.3.11.7.5.2	Purchase	SLAM Board	components		\$121,	560	\$121,560	\$0	0	0	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
10 12	MANDSPASS MANDSPASSL	120,000 1,560	120,000 1,560	0 days 0 days	3/21/05 3/21/05	5/27/05 5/27/05	\$120,000 \$1,560	\$120,000 \$1,560		\$120,000 \$1,560	
31	OSU Tech	1,300	40 hrs	0 days 0 days	3/21/05	5/27/05	\$1,300 \$0	\$1,500		\$1,500	
Note											
WBS D	escription:										
Purcha	se SLAM Board compone	nts									
M&S B	OE: \$39/hr X 400 hrs X 1	0% = \$1,560 (/	Assume FNAL	Elec Tech rate	e of \$39/hr)						
24 mod	lules +20% spares = 30 m	odules @ ~\$4K	for a Total of:	\$120,000. TI	nis translates	to \$114,112	in FY02 dollars.				
Labor E	BOE:										
10% O	SU Tech (?)										
1.3.11.7.5.3	. ,	Production S	I AM Boord		\$0		\$0	\$0	0	0	0
1.3.11.7.5.3 <i>Not</i> e		FIOUUCIIONS	LAW DUAIU		Φυ		φυ	Φυ	U	U	U

Notes
WBS Description:

Fabricate Production SLAM Board: Period of time for board manufacture.

M&S BOE: N/A Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.7.5.4	Assemble Production SLAM Board	\$0	\$0	\$0	0	0	0

Notes

WBS Description:

Assemble Production SLAM Board: Period of time for module assembly.

M&S BOE: N/A Labor BOE: N/A

Checkout Production SLAM Board 1.3.11.7.5.5

5.5	5	Checkou	t Production	n SLAM Boar	d	\$(6,240	\$6,240	\$0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
	6	PhysicistU	60%	240 hrs	0 days	6/21/05	8/30/05	\$0	\$0	\$0	\$0
	7	PostDocU	20%	80 hrs	0 days	6/21/05	8/30/05	<i>\$0</i>	\$0	\$0	\$0
	12	MANDSPASSL	6,240	6,240	0 days	6/21/05	8/30/05	\$6,240	\$6,240	<i>\$0</i>	\$6,240
	31	OSU Tech	50%	200 hrs	0 days	6/21/05	8/30/05	<i>\$0</i>	\$0	<i>\$0</i>	\$0

0

Notes

WBS Description:

Checkout Production SLAM Board: Task covers work required to checkout Finder modules.

M&S BOE: \$39/hr X 320 hrs X 50% = \$6,240 (Assume FNAL Elec Tech rate of \$39/hr)

Labor BOE:

30% OSU Physicist (Hughes) 30% OSU Physicist (Winer) 20% OSU Grad Student (Parks)

50% OSU Tech (?)

2
2
3
3

Notes

WBS Description:

Summary task for XFT-> Level 2 interface board.

WBS			Name	•			Cost	М8	S FNAL L	abor M&S	Cont. Labo	r Level
1.3.11.8.1		Specify F	Pulsar Boar	d for L2 stere	eo		\$0	\$0	50 \$0	(0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	7	PostDocU	10%	104 hrs	0 days	6/1/04	12/3/04	\$0	\$0	\$0	\$0	

Notes

Labor BOE: Greg Veramendi

1.3.11.8.2 Level 2 Interface Board Firmware (ILL) \$17.600 \$17,600 \$0 0.5 0.5 0 Baseline Cost Resource Name Work Act. Cost Rem. Cost Units Delav Start Finish Cost MANDSPASSL 0 days 9/21/05 \$0 12 17,600 17,600 1/7/05 \$17,600 \$17,600 \$17,600 28 20% 288 hrs 9/21/05 \$0 \$0 \$0 \$0 Mokos 0 days 1/7/05

Notes

WBS Description:

Exact design will await specifications of the Run 2b Level 2 trigger system. Format will be quite similar to the Run 2a Level 2 interface, but exact digital links are yet to be specified. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

\$7,920

0.5

0.5

0

M&S BOE: N/A

Labor BOE:

Time estimate based upon Run 2a XTRP/L2 interface.

20% UIUC Electrical Eng (Mokos) - 40w (320h)@\$55/hr = \$17,600 (Note ElecEngF - \$55/hr)

1.3.11.8.3 Level 2 Interface Board Firmware (FNAL)

.0		LOVOI Z IIIIOI	idoo Boaro	i i iiiiiwaio (i	. •/ •=/		Ψ1,020	ΨΟ	Ψ1,020	0.0	0.0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
Ī	4	ElecEngF	10%	144 hrs	0 days	1/7/05	9/21/05	\$7,920	\$8,800	\$0	\$7,920
	24	Holm	10%	144 hrs	0 days	1/7/05	9/21/05	\$0	\$0	\$0	\$0

Notes

WBS Description:

Exact design will await specifications of the Run 2b Level 2 trigger system. Format will be quite similar to the Run 2a Level 2 interface, but exact digital links are yet to be specified. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Time estimate based upon Run 2a XTRP/L2 interface.

100% UIUC Electrical Eng - 8w (320h)@\$62/hr * 0.25 (Eng. Labor reimbursement rate) = \$4960

WBS	1.3.11.8.4 Level 2 Interface Board Testing ID Resource Name Units Work Delay			(Cost M&S			bor M&S C	ont. Labo	r Level		
1.3.11.8.4		Level 2	Interface B	oard Testing			\$0	\$0	\$0	0	0.5	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	13	Physicist	100%	320 hrs	0 days	4/11/05	6/6/05	\$0	\$0	\$0	\$0	

Notes

WBS Description:

Time to install and check out Level 2 interface board. Will be performed in conjunction with Level 2 system testing.

M&S BOE: N/A

Labor BOE:

Physicist's estimate.

1.3.11.8.5		Pulsa	r & Mezzani	ne boards		\$5	2,218	\$47,600	\$4,618	0	0	0
1.3.11.8.5.1		Purchase	Pulsar Boar	d componen	ts	\$4	7,600	\$47,600	\$0	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
	10	MANDSPASS	47.600	47.600	0 davs	11/4/04	2/11/05	\$47,600	\$47,600	\$28.214	\$19.386	

Notes

M&S BOE: Six pulsar boards at \$4,100 each = \$24,600 in FY04 dollars

Hot link receiver mezzanine cards: 20 at \$300 each = \$6,000 in FY04 dollars

Hot link transmitter mezzanine cards (partially populated): 40 at \$200 each = \$8,000 in FY04 dollars

S-Link mezzanine cards: 6 pairs at \$1,500 per pair = \$9,000 in FY04 dollars

Total = \$47,600 in FY04 dollars **\$45,265 in FY02 dollars**

104105	_	E-b-iii D-l	O N4	: DI-	f10-1	_	Φ0		Φ0	фа			0	
1.3.11.8.5.2	<u> </u>	Fabrication of Pulsa	ar & iviezza	nine Boards	tor L2 stere	0	\$0		\$0	\$0		0	0	U
1.3.11.8.5.3	3	Assembly of Pulsa	r & Mezzar	nine Boards f	or L2 stered)	\$0		\$0	\$0)	0	0	0
1.3.11.8.5.4	4	L3 Begin Purch	ase of Puls	ar Board cor	nponents		\$0		\$0	\$0)	0	0	3
1.3.11.8.5.5	5	Begin Purchas	se of Pulsa	r Board com	oonents		\$0		\$0	\$0)	0	0	2
1.3.11.8.5.6	3	Modify Univ of Chicag	o SOW and	d MOU for Po	ulsar Purcha	ises	\$0		\$0	\$0)	0	0	0
	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Bas	seline Cost	Act. Cos	st Re	em. Cost	
	1	PhysicistF	10%	24 hrs	0 days	8/9/04	9/20/04	\$0		\$0		\$0	\$0	
	6	PhysicistU	10%	24 hrs	0 days	8/9/04	9/20/04	\$0		\$0		\$0	<i>\$0</i>	
1.3.11.8.5.7	7	Checkout of Pulsa	\$4,618		\$0	\$4,618		0	0	0				
	ID	Resource Name	Units	Work	Delay	Start	Finisi	n Co	st	Baseline Co	st Ac	t. Cost	Rem. Cost	
	5	ElecTechF	37%	118.4 hrs	0 days	3/14/	05 5/6/	OF C	1,618	\$4.0	200	\$0	\$4,618	1

**Checkout of Pulsar boards for Level 2 stereo and SVT* continued D	WBS			Name	•			Cost	М&	S FNAL	Labor	M&S Cont	. Labor	Level
30 Prep Tech 50% 160 hrs 0 days 3/14/05 5/6/05 \$0 \$0 \$0 \$0	"Checkout of	Pulsar	boards for Level 2 st	ereo and S\	/T" continue	ed								
Notes	Г	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline C	ost	Act. Cost	Rem. Cost	7
Labor BOE	Į	30	Prep Tech	50%	160 hr	s 0 day	s 3/14/05	5 5/6/0	95	\$0	\$0	\$0	\$0]
Solid Soli		Notes	1											
1.3.11.8.6 Joint testing with Finder board \$0	Ī	_abor B	OE											
ID Resource Name Units Work Delay Start Finish Cost Baseline Cost Act. Cost Rem. Cost						ards								
7 PostDocU 50% 80 hrs 0 days 5/2/05 \$0 \$0 \$0 \$0 \$0	1.3.11.8.6		Joint t	testing with	Finder boar	d		\$0	\$0		5 0	0	0	0
Notes Labor BOE: Greg Veramendi	Γ	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act.	Cost Rem	n. Cost	
Labor BOE: Greg Veramend 1.3.11.8.7		7	PostDocU	50%	80 hrs	0 days	5/2/05	5/27/05	\$0	\$0		\$0	<i>\$0</i>	
1.3.11.8.8 Begin Joint Testing with Finder Board \$0 \$0 \$0 0 0 1.3.11.9 L3 XFT Ready for Installation at CDF \$0 \$0 \$0 0 0 Notes Notes WBS Description: Milestone indicating XFT project complete. 1.31 L3 Start of Run 2b DAQ and Trigger Project \$0 \$0 \$0 0 0 Notes Notes \$0 \$0 \$0 \$0 0 0			OE: Greg Veramendi					<u>.</u>						
1.3.11.9 L3 XFT Ready for Installation at CDF \$0 \$0 \$0 0 0 0 Notes Level 3 milestone 1.3.11.10 XFT Ready for Installation at CDF \$0 \$0 \$0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.3.11.8.7		L3 Begin Jo	oint Testing	with Finder	Board		\$0	\$0	(60	0	0	3
Notes Level 3 milestone 1.3.11.10 XFT Ready for Installation at CDF \$0 \$0 \$0 0 0 Notes WBS Description: Milestone indicating XFT project complete. 1.31 L3 Start of Run 2b DAQ and Trigger Project \$0 \$0 \$0 0 0 Notes	1.3.11.8.8		Begin Joi	nt Testing w	ith Finder B	oard		\$0	\$0		60	0	0	2
Level 3 milestone 1.3.11.10 XFT Ready for Installation at CDF \$0 \$0 \$0 0 0 Notes WBS Description: Milestone indicating XFT project complete. 1.31 L3 Start of Run 2b DAQ and Trigger Project \$0 \$0 \$0 0 0 Notes	1.3.11.9		L3 XFT R	Ready for Ins	stallation at	CDF		\$0	\$0		6 0	0	0	3
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Notes WBS Description: Milestone indicating XFT project complete. 1.31 L3 Start of Run 2b DAQ and Trigger Project \$0 \$0 \$0 0 0 Notes	1.3.11.10		XFT Re	ady for Insta	allation at C	DF		\$0	\$0		6 0	0	0	2
Milestone indicating XFT project complete. 1.31 L3 Start of Run 2b DAQ and Trigger Project \$0 \$0 \$0 0 0 Notes		Notes	1	•										
Notes				t complete.										
Notes	1.31		L3 Start of R	un 2b DAQ	and Trigger	Project		\$0	\$0		5 0	0	0	3
WDC Description		Notes				•		•						
WBS Description: Milestone - marking the beginning of the Run 2b DAQ and Trigger upgrade project		NBS De	escription:											